Traffic Quarterly

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Editorial

Our serious problem of improving driving and our accident prevention program is national in character.

Elementary measures for the attainment of some appreciable progress are simple and fundamental. They can be readily and easily applied. They should vary little from one section of the country to the other but in their hit-or-miss application they have become a master problem of confusion.

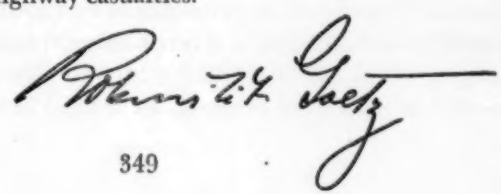
While repeated encouragement is provided from the highest national levels, the responsibility for positive and effective action remains divided among our forty-eight states. When considered at city, town and community levels there is no semblance of uniformity in purpose or effort.

One may cross the boundary between two states without concern except for sudden and radical changes in highway facilities and traffic control measures. They stem from similar authorities but challenge the understanding of the motor traveler. To add to the confusion, enforcement methods and measures are as varied as their jurisdictions, gaining for some of them unenviable distinction.

So long as these conditions continue to exist, traffic control will not be nationally successful nor can we expect to attain nationwide safe and efficient use of existing or future highways.

There is slight justification for such lack of uniformity and little reason to expect that a third of our population as licensed drivers will strive to attain a standard generally regarded as good driving. Good drivers are on the side of authority. They appreciate the enormity of the problem but feel that greater progress is essential. Many choose to remain off the roads at peak periods of travel rather than risk disaster.

To them the situation will remain intolerable until unified severe measures are taken to impress on poor drivers the full responsibility of their privilege. Until then we may continue to expect our unwarranted list of highway casualties.



How Much Further Can We Reduce Traffic Accidents?

NORMAN DAMON

Mr. Damon, Vice President of the Automotive Safety Foundation, has been engaged in work connected with highway transportation and traffic safety for nearly thirty years. During that period, he has been actively identified with the automotive industry's participation in all major activities concerned with the prevention of traffic accidents—from Committee secretaryship in the First National Conference on State and Highway Safety in 1924 to service as a consultant to the President's Highway Safety Conference in 1946 and succeeding years.

Among other activities, Mr. Damon serves as Chairman, National Committee for Traffic Training, and Chairman, Highway Research Board's Committee on Economic Costs of Motor Vehicle Accidents.

FOUR years ago, at the closing session of the first President's Highway Safety Conference, Paul G. Hoffman expressed an epoch-making challenge to cut the national traffic fatality rate in half in three years.

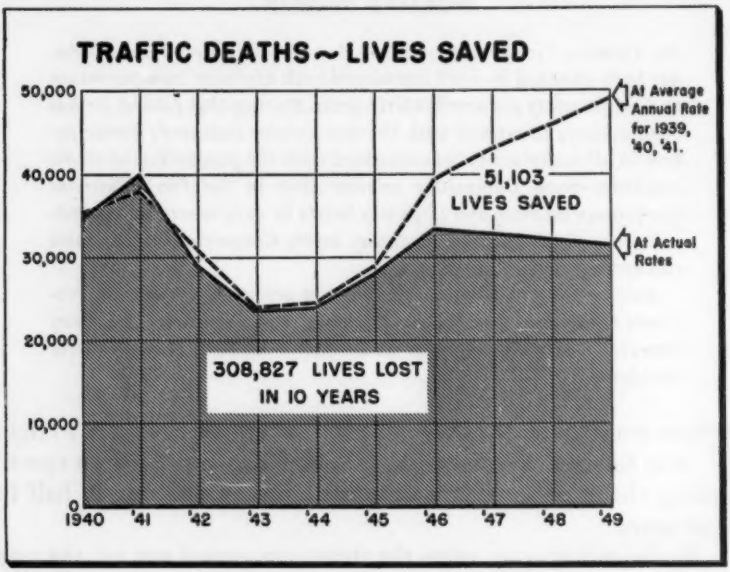
By the end of 1949, when the three-year period was up, the rate had been slashed 35 per cent. The reduction was accomplished with the most concentrated publicity and the most widespread official attention in traffic history.

True, we fell short of the goal set by Mr. Hoffman; but the long-range significance of the achievement was perhaps even more important than the immediate results. We had demonstrated for the first time the value of an organized attack on motor vehicle accidents, with states and cities across the land using a uniform plan whose central idea is *continuous action,* geared to constantly increasing traffic volume.

On the other hand, while we have made encouraging gains in terms of rate, we have been far less successful in curtailing the annual total in actual deaths and injuries. In no year since the end of World War II have we been able to reduce traffic fatalities below 31,500. The huge casualty list of injured continues to be as large as ever—a

million or more temporary or permanently disabled year in and year out.

But the most disturbing indication that we are perhaps reaching a plateau in accident reduction, at least with the present volume of



safety effort, is the record of the first six months of 1950. Total fatalities—15,080—have soared 11 per cent above those for the comparable period last year; while even from the standpoint of rate we are barely holding even.

Spread Between Ideal and Practicable Rate

This situation suggests that a forthright appraisal of how much further we can reduce traffic accidents is both valuable and necessary. How much further can we logically go? Ideally, if—

(a) all cars were designed and maintained at all times to maximum practicable safe standards;

(b) all highways were built to, and maintained and operated at maximum practicable safe standards;

(c) all drivers drove their best at all times; and

(d) proper supervisory and regulatory procedures for the safety and efficiency of highway traffic were everywhere in effect—

then we might conceivably bring the rate down as low as one fatality for each 100 million vehicle miles of travel.

Somewhere in the spread between the hypothetical rate of 1 and the current rate of 7.4 is the practicable minimum rate. From the evidence reviewed in this article, it will be clear that the national traffic fatality rate *could be reduced to 3 by 1960.*

That there is a broad potential area for such reduction is indicated by the generally accepted—and too generally ignored—fact that 85 per cent or more of all traffic accidents are preventable.

Traffic accidents, like the poor, will always be with us. Acts of God (flash floods, etc) normal operation of the laws of chance (truly unavoidable accidents such as a fatal heart attack at the wheel), and normal human error (professional baseball chalks up errors even for the best players!) will inevitably fix an irreducible minimum that no amount of effort could overcome.

We would be impractical idealists if we believed that ultimately we could eliminate all traffic accidents. Equally, we would be hopeless pessimists if we did not accept the premise that accidents still can be cut drastically below present levels.

Degree of Safety Up To The Public

What then are the basic limits to future reduction? Excluding an interruption due to a possible full-scale war[1] the extent of future progress depends on the answers to these questions:

(1) Will public opinion support intensified measures, or will there be a relapse into apathy until accidents and congestion become absolutely unbearable? The present year's "stand-still" record indicates that even now we may be heading into such a period of public indifference.

[1] In the event of an all-out war mobilization, of course, there is even greater urgency to increase the safety and efficiency of highway transportation through conservation of man power, automotive equipment and maintenance of the production lines, of which highway transport is an integral part.

(2) Are we willing to invest a great deal more in safety than we are doing now?

(3) How much "liberty" in driving and walking will we sacrifice for "security" from accidents?

Size of the Traffic Accident Problem

As a matter of perspective, we should first take a look at the dimensions of the problem.

We are concerned with nearly 45 million vehicles operated by some 60 million drivers over 3,300,000 miles of streets and highways, and running up an annual total of 450 billion vehicle miles. The economic importance of this vast movement of people and goods is reflected in the fact that highway transportation has grown into a 30 to 35 billion-dollar-a-year business.[2]

Now our annual losses due to traffic accidents amount to some $2.8 billion dollars. This in effect represents an accident tax of nearly 10 per cent added to the cost of motor transportation. But that's not all. This wholesale carelessness in traffic puts an additional drag upon the economy through "hidden costs," that may be double or triple such direct charges as medical and hospital bills, compensation payments and property damage.

The cost of public assistance to the indigent disabled and their dependents alone is tremendous. Recently the *New York Times Magazine* reported that nearly a million persons in the United States are permanently crippled as a result of injury or illness.

The American Medical Association reports: "We see that fatal accidents (of all kinds) outrank every other cause of death as a destroyer of working years of life—the years which represent the productive and military strength of the country. . ."

Accident Causes Are Compound

Virtually every accident involves two or more causes related either to physical deficiencies in the vehicle and road or to faults in the

[2] Brookings Institution estimated it at thirty billion dollars in 1948.

road user, whether motorist or pedestrian. Seldom is the car, the road, or the individual independently accountable for a mishap.

Because of this overlapping in assignment of causes, it is impossible to measure the extent of reduction that could be made by improvement in cars, roads and drivers by themselves.

However, National Safety Council reports based on state accident records indicate that poorly maintained safety equipment figures as a factor in from 10 to 15 per cent of all motor vehicle accidents.

Automotive and highway engineers both have been vitally concerned with fool-proofing their products—that is, with so designing them that the safest and most efficient use is the natural choice. Vehicles, through frequent design modifications, can be adjusted to changing conditions. Not so with highways, which must be built to serve at least two or three decades in the future.

Big Safety Potential in Highway Modernization

Modern highway design, including physical separation of opposing traffic streams and controlled access, offers a tremendous potential for reducing accidents. With their "built-in" safety features, such high-type roads as the Pentagon Network in Virginia, the Houston Texas Expressway and the extension of the Merritt Parkway in Connecticut, are keeping their traffic fatality rates down to approximately one-fourth the national average, or less than two fatalities per 100 million vehicle miles of travel.

In his special report on the 37,800-mile National Interstate Highway System, U. S. Public Roads Commissioner Thomas H. MacDonald estimated that if the rural sections of the system had been improved up to desirable standards for safety and efficiency, a saving of 1,400 lives might have been effected in 1948 alone.

Again, a series of studies recently completed by the Connecticut State Highway Department indicated that if all sections of the state network which are now sub-standard had been adequately improved, the death toll for the four-year period 1945–48 might have been cut by 43 per cent.

Greatest Margin For Improvement Lies in Drivers

The human element is, of course, the great variable. Driver errors are involved in 80 to 90 per cent of all accidents. Currently, probably not more than five to ten per cent of all drivers could be rated in the "professional" class that rarely if ever is involved in an accident.

Probably less than half of the 60 million drivers in the United States have ever had to demonstrate their fitness to drive in order to receive their license.

Perhaps the wonder is not that we have so many accidents but that the record is as good as it is, when, as Commissioner MacDonald says: "... the astronomical number of accidents that do not happen is terrifying..."

For a truly comprehensive approach to the safety problem, we must understand that we must bring *all accidents* under attack and not simply fatal[3] or serious personal injury accidents, because every accident has the same root causes and with a different combination of circumstances could result in a fatality or serious injury. Moreover, the chances for accidents increase percentagewise many times faster than the percentage increase in traffic volume. In other words, "chance-taking" more and more frequently results in an accident as exposure increases in proportion to traffic density.

Accident Record Reflects Tardy Control

Nationwide, the acceptance of "mass techniques" for the prevention of traffic accidents has proceeded with faltering slowness. For example, the first driver license law was adopted by the State of Massachusetts in 1903. As late as the mid-1930s only about one-half of the states had taken similar steps. Even today there is still one state without a driver license law of any kind.

As another illustration, the first state highway patrol was established in Connecticut in 1907. As late as 1924, only 14 states had state police departments, and even in 1930 there were still 24 states without rural enforcement.

[3] This article treats accidents chiefly in terms of *fatality rate* because fatalities are the only accurately reported item in accident statistics.

The excellent report on highway safety by the Council of State Governments, endorsed by the annual Governors Conference at White Sulphur Springs in June 1950, cites reasons for the haphazard progress in the use of basic control measures. The report says:

"The rapid growth of automobile traffic for many years outdistanced the efforts of the states to serve and regulate it. Motor vehicle departments, highway agencies and traffic patrols grew up overnight, and in many instances the new functions were assumed of necessity by existing agencies. Highways became the stepchild of public works departments, public utilities commissions, waterways and public land departments and state engineers. Registration and driver licensing were assigned to various existing departments—in one state to the department of state prisons."

Coupled with the tardy adoption of driver license laws and examinations, the relatively late assumption of rural patrol responsibilities by the states serves to explain in part why the rural traffic fatality rate has always been greater than the urban rate. The dominant factor is, of course, the greater speed prevailing on rural highways, which increases the severity of accidents and hence the rural death rate.

Between 1924 and 1935, rural traffic deaths increased 150 per cent, while those in cities rose only 27 per cent. For the past few years, the rural rate has been double the rate in urban areas, despite the fact that traffic is fairly evenly divided. Certainly another reason why rural enforcement has not been able to keep abreast of its share of the vastly increased traffic is that by and large, state patrol forces are not being maintained at maximum authorized levels.

Analysis of state records seems to indicate a very close relationship between the length of time that regulatory agencies have been functioning and the effectiveness of accident control. The following table lists the six states with the best traffic fatality rates, and the six with the worst. It is noteworthy, for instance, that there is a 44-year spread between the adoption of the first driver license law in Massachusetts and the latest one in Wyoming. The six best states, on the average, had approximately a 30-year start in driver licensing over the six worst states.

Six States With Best Rate	*1949 Traffic Fatality Rate*	*State Patrol Established*	*Driver Licensing Adopted*	*Drivers First Tested*
Rhode Island	3.0	1925	1908	1908
Connecticut	3.4	1907	1907	1917
New Jersey	4.1	1921	1906	1913
Massachusetts	4.2	1921	1903	1907
New Hampshire	4.6	1937	1905	1920
Vermont	5.4	1919	1905	1925
Six States With Worst Rate				
Alabama	11.1	1935	1939	1939
South Carolina	11.0	1930	1930	1933
Arizona	10.7	1931	1927	1935
Wyoming	10.4	1933	1947	1947
New Mexico	10.1	1933	1937	1938
Nevada	9.6	1923	1941	1941

Integration and Uniformity

Any discussion of prospects of accident reduction in the future must necessarily evaluate the extent and efficacy of past efforts. A backward glance discloses two fundamental trends—increasing integration of safety activities on a nationwide scale, and growing emphasis on uniformity in traffic laws and control devices, administrative policies and procedures and in organizational patterns. We have made a start even in standardizing the professional training of traffic personnel and in public safety education.

In a sense, this important trend toward uniformity—the systematized as against the random approach—stems from the consolidation of safety activities throughout the country. It is therefore of interest to trace the development of the coordinated effort.

Prior to 1924 only a few states and cities conducted traffic safety programs, and these generally carried on their work independently of one another. Such national organizations as had an interest in the subject embarked on specific programs, and seldom did these groups seek to correlate their efforts.

Waves of Concerted Action

But beginning in the mid-Twenties, we can identify three distinct "waves" of coordinated action, each having its source in an unprecedented upsurge of traffic accidents. The first occurred in 1924, when Herbert Hoover, then Secretary of Commerce, called the first National Conference on Street and Highway Safety. His keynote remarks have a familiar, if slightly ironic, ring for us today. He said in part:

"The American people have at last awakened to the appalling situation and are demanding in no uncertain terms that something be done about it and that something soon."

From that conference came eight specific committee reports—on accident statistics, traffic control, road construction and engineering, city planning and zoning, education, motor vehicles and public relations. The seeds for a comprehensive and balanced plan based on the three E's of traffic safety—Enforcement, Engineering and Education—were beginning to germinate.

Subsequent conferences in 1926, 1930 and 1934 produced two major developments: 1) the Uniform Vehicle Code for States, the Model Traffic Ordinance for cities, and the Manual on Uniform Traffic Control Devices; and 2) the first move toward a coordinated coast-to-coast program with the publication of "Guides to Traffic Safety"—a summary of recommendations on salient phases of highway safety, designed for use by official and non-official groups in every part of the United States.

Weaknesses of Earlier Programs

Greatest weakness of the program at that time was the failure to nail down the responsibility for follow-through. Almost wholly overlooked was the designation of leadership and provision of staff and money to implement the plan. Nevertheless, due principally to the focusing of public attention on the problem, this embryo drive for concerted action during the period from 1924 through 1935 helped to bring the fatality rate down from 19 to 15.9, or 16.3 per cent.

Next, as we came out of the sloughs of Depression in the early

Thirties, symptoms of our recovery were rapid expansion of motor vehicle use and a frightening upswing of the fatality curve. When in the two successive years of 1934 and 1935 the toll reached a new high of 36,000 deaths, J. C. Furnas tossed a bomb into public complacency with his sensational article, "—And Sudden Death."[4] The *Detroit News* ran a front-page editorial headlined "Stop the Automobile Slaughter!" and newspapers across the land picked up the theme.

This generated the second major wave of action, sparked by the automotive industries, which established a fund of approximately one-half million dollars with which to step up the application of proven techniques. The Automotive Safety Foundation was organized as the administrative agency to encourage coordination of effort through annual grants of funds to universities and prominent organizations spearheading the work.

Standard Highway Program for States

To dramatize and integrate these activities in a united effort, 12 national organizations in 1937 formulated and sponsored the Standard Highway Safety Program for States. The elements were virtually the same as those highlighted by the series of National Conferences on Street and Highway Safety, and subsequently formed the backbone for the Action Program of the President's Highway Safety Conference.

One highly significant advance was the clear definition of responsibility of state governments. Recommended for the first time were coordinating committees of state officials, with corresponding public support groups. Equally important, for the first time, technical staffs were made available to states and cities, to enable them to put into effect modernized techniques of accident prevention.

Reasonably adequate funds were made available with which to support and expand the accepted plan, at least on a pioneering and demonstration basis. The net result during this period from the beginning of 1936 through 1941 (the last pre-war year) was a reduction in the traffic fatality rate from 15.9 to 12, a further drop of 24.9 per cent.

[4] Reader's Digest, Aug. 1935.

The Action Program Comes Into Being

The third distinct wave came postwar, as the end of travel restrictions initiated a spectacular new increase in automobile use, together with an alarming onrush of accidents. Deep concern with the mounting traffic toll, producing casualties comparable to those of the conflict just ended, prompted the White House to call the first President's Highway Safety Conference.

From that conference came the well-known Action Program, a distillation of the best features of the previous programs—plus the experience and judgment of the 2,000 or more public officials, safety authorities and citizens attending those sessions. The tremendously accelerated activities which resulted from the first and subsequent President's Conferences have brought the rate down from 12 at the close of 1941 to 7.4 in 1949—a reduction of 38.3 per cent.

A characteristic common to these three waves of action seems to be the tendency to spend themselves within a limited period of time. If the flattening out of the rate over the past year and a half can be correctly interpreted as meaning that we can do no more than hold even with the present volume of effort, then clearly another major wave of activity is imperative if we are to have further progress.

Basis for Fourth Wave

Fortunately we have the basis for such a wave in the action of the 1950 Governors Conference, calling for a careful study of highway safety problems in each state and the development of a well-rounded program before the meeting of the next Legislatures. A resolution adopted by the Conference urged every Governor to seek appropriate legislative steps in 1951, when forty-four of the state assemblies will be in session; and to that end each state chief executive was asked to name immediately an individual or a board to work out detailed legislative measures for implementing the program.

With responsibility now focused squarely upon state governments and state legislatures and upon city governments and city councils, the objectives of this next major impetus appear to be twofold: 1) strengthening of traffic controls, with greater uniformity of

laws and authority, as well as of administrative policy; and provision of adequate professionally trained personnel; and 2) universal use of mass techniques such as driver licensing; high school driver education; selective enforcement, especially in rural areas; traffic court educational programs and violators schools; fleet training programs; periodic vehicle inspection, and highway improvement, including traffic engineering.

For the new wave to materialize, each state individually must accelerate its drive for safety. Prompt and all-out support must be forthcoming from all interested groups.

Doing Only A Partial Job

Currently we are hardly scratching the surface in many of these and other areas. As a matter of fact, according to best available yardsticks, we are doing little more than half the job we already know can be done.

The Annual Inventory of Traffic Safety Activities of States and cities, conducted by the National Safety Council for the President's Conference, bears this out. While the Inventory is one of the most important tools ever devised for the measurement of traffic safety progress, the performance standards which it uses are admittedly short of perfection.

For one thing, some of the standards lean toward minimum acceptable performance, as for instance the minimum standards for driver licensing approved by the American Association of Motor Vehicle Administrators. For another, the state and city reports are submitted in connection with award programs, and it would be contrary to human nature if slightly exaggerated claims did not creep in here and there!

For 1949, the average of all the states on the best judgment of the qualified technicians who evaluate these activities both as to quality and quantity shows that we are still a dismaying distance from full application of the basic Action Program. It will be noted that the phases covered by the Inventory, as shown in the following table, do not include such other important areas as modernization of streets and highways to safe design standards:

EXTENT OF PROGRESS TOWARD CONFORMANCE WITH MINIMUM INVENTORY STANDARDS—1949

Action Program items rated by Inventory	*Figures represent full conformance, on point basis, with Inventory standards*	*Average rating, on point basis, of the 48 states*	*Percentage average of the 48 states*
Traffic Legislation	60	33.3	55.5%
Accident Records	90	58.3	64.9%
Traffic Engineering	90	57.0	63.3%
Enforcement	90	57.7	64.1%
Driver Licensing	90	60.8	67.5%
Periodic Vehicle Inspection	40	14.3	35.7%
School Safety	90	61.2	68.0%
Public Information	50	39.7	79.4%
Safety Organization	100	48.3	48.3%

The shortcomings indicated in these statistics become even more glaring when spelled out, as they are in the committee reports of the President's Highway Safety Conference and in the comprehensive report of the Council of State Governments previously referred to.

Traffic Laws

For example, both the states and cities are seriously lagging in the urgent task of eliminating the confusion and vexations due to non-uniform traffic laws. Some thirty states have not as yet taken the recommended first step of comparing their existing traffic statutes with the Uniform Vehicle Code; only a handful of muncipalities have measured their regulations against the Model Traffic Ordinance.

To date, only thirteen states have in force a body of traffic law which conforms fully with the Code. Only a little more than a half of the states have enacted a substantial portion of Act V—the uniform "rules of the road" Act, especially important to both motorists and pedestrians from the standpoint of safety.

While all states but one have a driver license law, in only 25 states does it square with most of the provisions of Act II of the Code. "In

many states licensing is a farce," asserts the Council of State Governments. "When licensing is merely a routine, clerical chore, carried on solely for the revenue it produces, it does not serve as a safety measure."

In the opinion of the motor vehicle administrators themselves, driver license examinations in more than half of the states are inadequate. Moreover, in 30 states the laws fail to give the administrator authority to require the re-examination of accident-prone drivers. In view of the fact that most authorities feel that drivers should be re-examined periodically, it is significant that the laws of only three states contain such a requirement.

Certainly it is not conducive to safety, either, that states for the most part fail to: a) examine commercial drivers in the same type of vehicle they are to operate; b) give new applicants or those re-examined a test of ability to drive in fast, heavy rural traffic; and c) give any night-driving road tests.

The over-all licensing picture is not brightened in any respect when we realize that an average of only 18 per cent of the revenues received from license fees are spent for licensing and driver improvement.

Accident Records

The resultfulness of the entire Action Program depends on how well accidents are reported and analyzed, and how well the processed information is used. Today accident data are woefully inadequate. Three states do not even require the reporting of accidents.

The record bureaus in many of the states lack adequate financial support and recognition as an integral part of the safety machinery. Deficiencies include a low volume of accident reporting and processing, lack of sufficient staff, facilities and equipment, lack of centralized responsibility for reports and records, and failure to analyze and interpret the records for use by other state agencies concerned with highway safety.

Only a third of the states prepare special data of this kind for enforcement purposes; only one-fourth make any attempt to provide such information for public education.

As the Committee on Accident Records of the President's Conference points out, "The relatively few instances in which states or

cities have even begun to realize the potentialities of an adequate record system serve only to emphasize more clearly the low level maintained by the majority."

Engineering

Construction of new highways or major rebuilding, where needed, must go hand-in-hand with sound traffic management on all roadways which cannot, within the immediate future, be wholly modernized for the amount of travel they are expected to carry. Earlier we touched on the striking safety gains that have been achieved on the fine expressways and parkways which have been built in recent years. However, the vast majority of our roads and streets will have to continue to serve for a long time to come, which means that we must look to traffic engineering to make these facilities as safe and efficient as possible.

On the organizational side, forty-three states have created within the highway department, as the Action Program recommends, a division responsible for traffic operations. In the cities and towns, however, traffic engineering progress has been generally slow both in the employment of qualified personnel and in their work programs.

The 1949 Inventory showed that only 48 per cent of all cities in the population groups from 50,000 and up have thus far employed traffic engineers. In the very large group of municipalities of 50,000–100,000 population, only 20 per cent have traffic engineers.

Stressing the necessity of state assistance in this area to communities, the Engineering Committee of the President's Conference says, "Despite the localized nature of traffic accident problems generally and the crying need for effective local machinery for improving safety, the state remains—at least in the engineering field—as the key body for leadership and action in traffic safety matters."

Enforcement

Enforcement is without doubt the most immediately effective measure for accident reduction, and perhaps the most easily measurable as to results. Almost invariably the accident curve descends as the curve of warnings, arrests and convictions rises.

Yet enforcement by police and traffic courts today is falling far short of safety requirements, with weaknesses most marked where stepped-up control is most desperately needed—in small towns and rural areas. Both city and state police need more traffic personnel plus more participation of the uniformed forces in traffic law enforcement; upgrading of recruit and in-service training; increased effort against accident-causing violations, and intensified programs for pedestrian protection.

According to the Council of State Governments, traffic courts in many instances "have been rendered ineffectual by unqualified judges, prosecutors and other judicial personnel; by the practice of ticket fixing; poor courtroom facilities; by the fee system by which judges are paid from the fees they collect; and by inconsistencies in the imposition of fines and penalties."

As a fundamental step toward improving the administration of justice by traffic courts, the President's Conference recommends that all the courts be unified under statewide supervision of the state supreme court. To date, only two states—New Jersey and Missouri—have effected such essential reorganization. A report on the work of the New Jersey traffic courts under the new system reveals that during the first six months of 1949, there was a 12.2 per cent increase in convictions and a 57.8 per cent decrease in the number of dismissals of traffic cases, compared with the similar period the year before, despite a 3.2 per cent decline in the number of tickets issued by the police. Further, the number of offenders who failed to appear in court decreased 89.9 per cent.

From the standpoint of public education and the improvement of driving attitudes, the traffic courts of the nation have not even begun to reach their vast potential service. We have an outstanding example of what can be done in the work of one Los Angeles Traffic Court. The judge opened each session with a traffic safety talk, and has achieved this striking record: Of 300,000 violators who appeared before him in a two-year period, less than one per cent ever came a second time.

This achievement bears thinking about, in the light of the 8 million or more offenders who show up in our traffic courts every year.

Education

Under education, the possibilities in the mass production of good drivers through standardized training in the schools are gaining nationwide attention. Studies have shown that high school-trained drivers have only one-fourth to one-half the arrests and accidents experienced by untrained drivers in the same age group. Last year recorded an increase of approximately 25 per cent in the number of driver education courses offered and total students enrolled. At present, however, only about 16.5 per cent receive both behind-the-wheel and classroom instruction—some 300,000 out of more than 2 million young people who reach driving age annually.

In the area of traffic personnel training, impressive results have followed the specialized instruction now offered at many colleges and universities. Each year more and more of these trained technicians—traffic engineers, fleet supervisors, police administrators and safety teachers—are assuming responsible positions in fields related to highway transportation. It is no coincidence that the states and cities regularly at the top of the standings in the national traffic safety contests are those with professionally trained men in charge of their traffic programs.

Although this type of training is gradually expanding, the present trickle of graduates must swell into a wide and steady stream, if the availability of qualified personnel is ever to catch up with the growing need.

We have a good illustration of this in the fleet supervisor training program, under which nearly 5,000 executives in charge of 950,000 truck and bus drivers have received instruction. Yet this total of trained supervisors is decidedly small when one considers that there are about 5 million commercial vehicle drivers in the United States.

Safety Organization

Continuity and effectiveness of the traffic safety effort depend upon the development of strong organizations in the states and communities. Substantial progress has been made in this direction, although here, too, accomplishment has been nowhere near as extensive as it

should be. Following the Action Program recommendation, 37 states have created active coordinating committees of state officials. On the other hand, only 22 states have met the corollary requirement of establishing permanent public support groups.

Less than 30 per cent of the cities, including those in all population groups from 10,000–25,000 and up, have moved to form organized public support groups since the first President's Conference in 1946. Only a relatively small proportion of the municipalities have taken the initial step of holding citywide traffic safety conferences to establish a balanced program.

Motor Vehicle Inspection

A virtual stalemate in periodic inspection has existed the last ten years. Since 1939 no state has enacted a periodic inspection law enforced today, and four states have repealed statutory provision for this activity.

Yet inspection is recognized as an essential, if not primary, element in a well-rounded safety program. There are hordes of vehicles with poorly maintained safety equipment on the road. A number of states have done a highly successful job of control through periodic inspection. New Jersey, a state notably advanced in the development of a balanced safety program, has had a state-owned and -operated system since 1938. It is significant that a 30 per cent reduction in traffic fatalities was achieved during the first inspection period, as compared with the corresponding period the previous year. Furthermore, this improvement has been sustained substantially through the years.

In cases like New Jersey, the people of the state have been properly indoctrinated through public education activities to understand the need for such a system. The only logical inference to be drawn from the failure of Legislatures in other states to enact such measures is that insufficient effort has been spent beforehand to build up an informed public opinion.

Public Information

Possibly the most promising sign on the whole safety horizon is the unprecedented volume of public information work now going on. Not only does this reflect the better-integrated educational job being done by state and local governments, civic organizations and the major informational media but, conversely, it shows that one of the most potent of weapons in the war against accidents is being utilized to speed up and intensify the over-all program.

More adroitly prepared and more widely promoted than even before, current information programs are at work night and day helping to keep motorists and pedestrians safety-conscious. Typical of the effectiveness of many of these programs is "Operation Safety," sponsored by the National Safety Council. Using a uniform monthly theme for nation-wide emphasis, based on some phase of the Action Program, and projected with a tremendous amount of radio, newspaper, television and other media support, its timely message covers the whole of America.

Factors Not Subject to Control

From the preceding discussion two facts stand clear: first, that sharp and permanent reductions in traffic accidents can be secured by organized efforts; and second, that what has been accomplished even recently has not represented much more than an average 60 per cent application of recognized s- -ty measures.

Still more disturbing is the fact that many of our most vital "mass techniques" are far below that level—as for example, high school driver training, with only about 16.5 per cent of eligible students now receiving behind-the-wheel instruction.

Here it is well to note that we have been dealing only with those factors affecting accidents which are subject to control. There are others, of course, widely varying in different states, over which normally we can exert little influence. These include such items as density of vehicle registration per capita; annual vehicle consumption of gasoline; percentage of urban versus rural population; volume of rural travel; increase in shift of population from urban to "peri-

meter" areas; availability of hospital and medical facilities; basic terrain; characteristic weather conditions, and amount of foreign or out-of-state traffic.

Some authorities hold that such non-controllable elements may account for as much as two-thirds of the disparity in traffic death rates among states. For example, consider the single factor of hospital and medical facilities. Long-established urban areas are usually more amply supplied with well-equipped facilities than rural places, with the result that many lives are saved that otherwise would have increased the traffic death total. Certainly this must have considerable weight in highly urbanized New England, where traffic fatality rates have been consistently lowest.

Influence of the Big Registration States

Moreover, we must remember that it is a comparatively small block of states, with a preponderant number of motor vehicle registrations, that exerts the most influence on the national accident picture. The six top registration states account for 40.2 per cent of all registrations and 39.8 per cent of all traffic fatalities.

Now the six best states, from the standpoint of traffic fatality rate, represent only 8.5 per cent of the total vehicle registrations and 4.8 per cent of total fatalities. At the other end of the scale, the six worst states represent only 3.9 per cent of the total registrations and 6.4 per cent of the fatalities.

It is thus apparent that neither the few best states nor the few worst will have any considerable effect on the national record. The big registration states, since they largely determine the schedule of safety progress, must serve as the bell-wethers in the concerted efforts of all the states.

Rate of 3 Within Next Decade

With this background, a knowledgeable guess may be ventured as to how much further we can reduce the traffic toll. Obviously, from what has been said, it *can* be cut, and cut drastically.

Assuming, therefore, that a new "wave" of accident prevention develops as expected—

Assuming that all states, particularly the top registration states, fill the gaps reflected in the Inventory, which show only about 60 per cent conformance with the Action Program—

Assuming also the additional impetus that may be expected in the next few years from a refinement of techniques as a result of experience and of safety research now underway or projected—

Granting these plausible assumptions, then there is no logical reason why the nation's fatality rate cannot be cut to 3 within the next decade. This rate has already been reached by one state and approached by others—even though these states, too, are still far from full adoption of the Action Program.

Achievement of this reduction would mean a huge annual saving in lives and money. We get some idea of how much when we reflect that had a rate of 3 prevailed in 1949, we could have saved 18,750 lives, nearly 650,000 injuries and over one billion, six hundred million dollars in economic losses last year alone.

The job can be done. The national interest and every humanitarian consideration demand that it be done. Will we do it?

New Plan for Same Old Streets

WILBERT F. WATKINS

Mr. Watkins has been Traffic Engineer for the City of Louisville, Kentucky since 1945. For four years prior to that, he was Traffic Engineer for the State of Kentucky. He worked as a Street and Bridge Design engineer for the U. S. Engineers from 1932 to 1934, and in the same capacity for the City of Louisville from 1934 to 1940. He attended Yale University on a Fellowship granted by the Bureau of Traffic Research, 1940–41. He is a member of the Institute of Traffic Engineers; of the Kentucky Society of Professional Engineers; and he is registered as a Civil and Traffic Engineer under the laws of Kentucky. In 1948, he was selected as the Representative for Outstanding Accomplishment in the Field of Good Government by the Louisville and U. S. Junior Chamber of Commerce. On July 1, 1950 he was appointed Director of a newly created Department of Traffic Engineering in the City of Louisville.

IN 1948, shortly after Charles Farnsley became Mayor of the City of Louisville, he requested several national organizations to determine through the medium of polls and surveys just what were the pressing problems in Louisville according to the needs and wishes of the people.

The necessity for two pursuits in City administration ranked high among the results: the improvement of the movement of traffic and the lessening of the accident rate.

These wants were further verified by the verbal expression of the people at the Mayor's weekly "beef sessions." These are open meetings every Monday with the Mayor at City Hall to which any one may come and be heard on any matter pertaining to the operation of city government and its responsibilities to its residents.

At that time, Mayor Farnsley began work on the development of City-wide plans to meet the exigencies of the people. To the accident problem, he adopted a psychological approach: He had studies made of accidents by economic, class and neighborhood distribution groups within the city. With his traffic engineer and planning advisors, he determined which streets, already in existence, could best serve as arteries to accommodate the flow of traffic at a maximum

rate of speed and safety. Under this plan, to date, the following improvements have been completed:

Street Repaving

To create the "rideability" necessary to induce motorists on to the streets designated as traffic arteries under the city's plan, a considerable amount of street resurfacing was necessary. Costs were kept to a minimum by "half-soling," or resurfacing only the driving lanes, of streets where use of the parking lanes for the movement of traffic was not contemplated. According to the City Engineer, Wallace W. Sanders, approximately ten additional miles of streets were paved due to the savings of "half-soling."

The only major problem from this manner of resurfacing has been the impounding of several inches of water during heavy rains at the intersections of such "half-soled" streets where it was, of course, necessary to pave the full width of the intersecting streets. Few if any parking problems have arisen from the lower-level parking surface as the ridges between driving and parking lanes on these streets have tended to taper themselves down with a few weeks' wear.

The resurfacing program embraced a total of 78.4 miles of streets: 49.6 miles were resurfaced from curb to curb, and 28.8 miles were "half-soled." Of this total mileage, 14.8 miles of streets were paved by the Kentucky State Department of Highways on routes it maintains within the city limits. The remainder of the work was divided almost equally between independent contractors and the City forces. The specifications for the work were as follows: (a) On brick and granite streets and streets with abandoned street car tracks, two layers of asphaltic concrete were used or a total of about 250 pounds a square yard; (b) On old asphalt streets with a good cross-section, one layer of about 160 pounds of material a square yard was used. The asphaltic concrete contained about five per cent aggregate below 200 sieve and seven per cent bitumen.

One-Way Streets

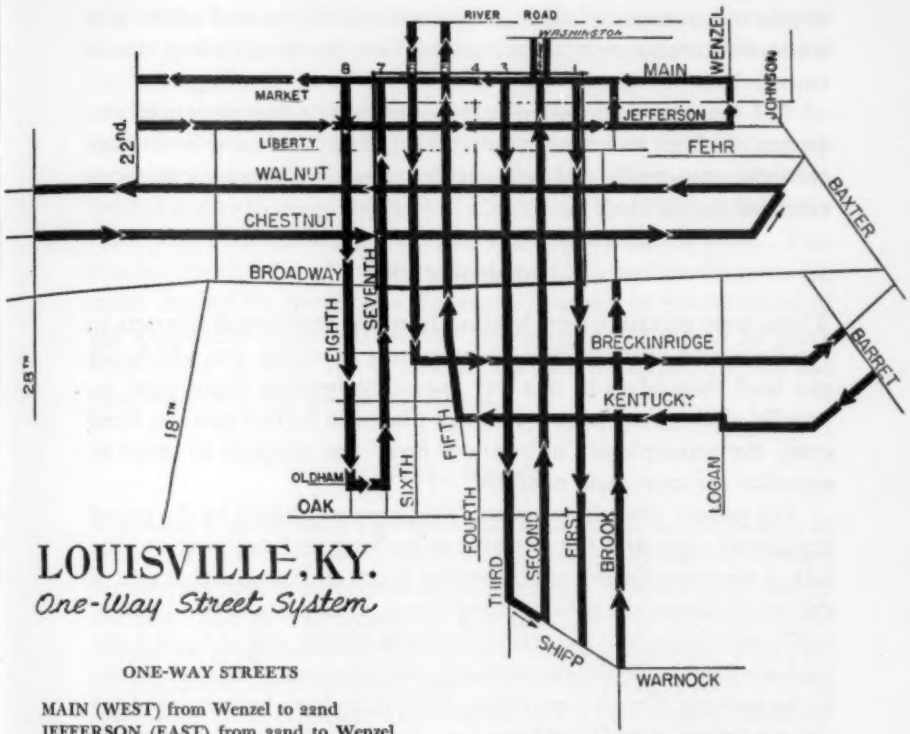
Thirty-three miles of one-way streets have been established to accommodate the movement of traffic within the downtown area and to connect large population pools with this central district. The program was progressive and on the following basis: an initial one-way street system was set up in downtown Louisville with alternate streets running in opposite directions, both north-south and east-west. Later, this system was connected to our principal residential centers with a pair of one-way streets. The whole plan was developed step by step over a period of three years so as not to cause too great an impact on motorists' driving and parking habits.

In the beginning, there were heated objections by downtown merchants and business men who were directly affected by the one-way street program. Considerable time was spent in explaining this program and its immediate and long-range benefits to the Louisville Safety Council, Automobile Club, Chamber of Commerce, and Retail Merchants' Association, and enlisting their aid in selling this program to the dissenters. In time, they were convinced that both safety and business would benefit from the plan, but it has been the average motorist who has been our greatest supporter in the enlargement of the program and the establishment of additional one-way streets.

A number of before-and-after studies have been made with respect to accident frequency on streets converted from two-way streets to one-way operation. Generally, the accident rate has decreased, but this decrease is neither uniform nor positive. In other words, every street converted to one-way operation does not show less accident frequency, yet the sum total of all streets which are now one-way does indicate an over-all decrease in accidents.

Without exception, our one-way streets have shown heavier usage within thirty days after installation. This heavier usage is sustained and increased over the periods of one, two and three years they have been in operation. Some of our streets have increased from a total volume of 5000 cars, during the twelve hours from 7 A.M. to 7 P.M. on a weekday, to 6500 cars within a period of thirty days. On one pair of one-way streets, we have increased the usage

of one of the streets from 2500 cars to 10,000 cars a day and simultaneously decreased the use of its companionate street from 14,000 cars a day to 10,000.



LOUISVILLE, KY.

One-Way Street System

ONE-WAY STREETS

MAIN (WEST) from Wenzel to 22nd
JEFFERSON (EAST) from 22nd to Wenzel
WALNUT (WEST) from Chestnut to 28th
CHESTNUT (EAST) from 28th to Walnut
BRECKINRIDGE (EAST) from 6th to Barret
KENTUCKY (WEST) from Logan to 5th
SHIPP (EAST) from 3rd to 2nd
FIRST (SOUTH) from Main to Broadway
SECOND (NORTH) from Shipp to Washington
THIRD (SOUTH) from Main to Shipp
FIFTH (NORTH) from Kentucky to River Road
SIXTH (SOUTH) from River Road to Breck
BROOK (NORTH) from Shipp to Broadway
SEVENTH (NORTH) from Oldham to Main
EIGHTH (SOUTH) from Main to Oldham

Business district, marked on the map by thin black lines, is bounded by Market Street and Broadway.

The popular objection of merchants and business men that one-way streets would adversely affect their businesses has not been substantiated by our checks. We have found that a number of businesses that suffered some loss during the first sixty to ninety days of one-way operation had recouped entirely by the end of the first six months. Some merchants have told us that the one-way streets caused them to lose old customers, only to be replaced by new.

We have recently added seven miles of one-way streets to our system of which two are six-lane thoroughfares, moving four lanes of traffic eastwardly and westwardly, respectively, with two lanes reserved for parking.

Unbalanced Flow

There were certain streets leading from the residential districts to the downtown area which it was necessary to utilize, but which did not lend themselves to one-way operation because there were no parallel streets conveniently enough placed to form a pair. In these cases, the principle of "unbalanced flow" was adopted in order to expedite the movement of traffic.

On 40-foot (four-lane) streets, this is accomplished by the use of regulatory signs and the removal of parking and stopping on one side of the street during peak morning hours and on the other side of the street during the peak evening hours. This permits two lanes of traffic movement into the central business district and one out of the business district during the morning and a reversal of this procedure in the evening. On 36-foot streets, three lanes have been marked for the movement of traffic and one lane for parking. Here, the driving lanes are ten feet wide and the parking lane is six feet wide. Lane lights are used in connection with type of operation, permitting two of these three lanes to move traffic into the business district during the peak morning hours and two lanes out of the business district during the peak evening hours. During the remaining twenty hours of the day and night, the middle lane is used for passing and this is indicated by a flashing yellow light. Thus, in the case of a 36-foot street, an unbalanced flow of traffic is attained morning and evening by reversing the flow in the middle lane.

Considerable difficulty was encountered from business men whose property fronted these streets, due to the removal of customer parking by the "No Parking" regulations effective during such times as the curb line was needed for the movement of traffic. These objections have gradually subsided as motorists have made adjustments in their parking habits and a mental concession as to "natural street usage."

Due to unbalanced-flow principles, the use of streets has increased without exception. In some instances street use has gone up as much as 25 per cent over a period of a year. Unbalanced flow has tended also to increase the ratio of directional flow. This rate has increased in some instances from 2-to-1 to approximately 3-to-1. This can be accounted for by the attraction of additional traffic onto the street during the period of unbalanced flow and in the direction of the multi-lane traffic movement. Motorists are found to be more enthusiastic in their use of lane lights with unbalanced street use than even their use of one-way streets.

Traffic Signals

The City is developing a program of traffic signal improvement in which all traffic signals in the city are to be either inter-connected for the progressive movement of traffic or of a traffic-actuated design. During 1949, of 180 signalized intersections, 107 were inter-connected for progressive movement and twenty-seven more were converted to the traffic-actuated type. Of the remaining forty-six, the Kentucky State Highway Department has appropriated funds for twenty-six signals, located on state-maintained routes, to be modernized and converted to traffic-actuated equipment, and the City is planning to convert the remaining 20 during 1950.

We have had no opportunity to study in detail the full effect of our traffic signal program on accident frequency. However, at four representative intersections signalized at the beginning of 1949, the records show that twenty-four accidents occurred in 1948, the year *prior* to signal installation, and fourteen accidents in 1949, the year *after* installation.

Our experience has convinced us that the traffic-actuated type of

signal is the most efficient kind at an isolated intersection. The volume-density signal is capable of many different cycle lengths and cycle splits during the course of a day and the signal is constantly adjusting itself to fit changing traffic needs at an intersection. Further, this flexibility of a volume-density signal is often the difference between congestion and the free flow of traffic.

Mayor Farnsley has other values that he places on traffic-actuated equipment. He believes that they have strong psychological effects by giving each motorist a "vote," as it were, in the control of the signal and the allocation of the cycle.

We adhere closely to the manual on Uniform Traffic Control Devices in our recommendations regarding the installation of all traffic signals with the single exception that the Mayor will occasionally recommend the installation of a signal where pedestrian needs are overwhelming.

Street Lighting

The City has lighted twenty-five miles of its heaviest traveled streets in the downtown area to conform with the Illuminating Engineering Society standards, thus creating a "White Way" in the downtown business district and on the major streets approaching this area. The standards, set at 100-foot spacings, were modernized from ornate, upright type fixtures to the pendant type. Eighty-one "D" luminous incandescent lights are being used in this lighting.

There has been a marked general improvement in the movement of traffic on these streets during the hours of darkness although detailed accident studies have not been conducted. Likewise, according to the Police Department, the law-enforcement problems in these areas have lessened and the morale of the residents in the substandard residential areas fringing the business district has improved.

Signs and Markings

The total mileage of striping on Louisville streets during 1949 was increased from 75 miles to 150 miles. This additional mileage included all streets designated as boulevards or preferential streets. Reflectorized paint is used for all such striping in the city.

In addition, twenty-five miles of parkways have been marked with delineators placed four feet from the edge of the roadway on 100-foot centers. These delineators serve several purposes: (a) to mark the "Louisville Drive," which was so called because it circles the major portion of the City; (b) as an aid in overcoming a tendency to run off the road at curves; and (c) to give the driver more assurance as to the direction of the roadway during foggy and inclement weather.

All traffic signs in the City have been renewed and modernized in accordance with the manual on Uniform Traffic Control Devices, which necessitated a complete modernization of our sign shop and the installation of infra-red ovens.

We have been successful in our use of four-way stops, in connection with the signing program, provided the intersecting streets do not exceed thirty-six feet and provided the total volume through the intersection does not exceed 5000 to 6000 cars per twelve-hour week-day. In some instances, right-angle collisions have been reduced from twenty to thirty a year to as low as one to two accidents during the year following installation. As we have not had this success at the intersections of wide streets, we have established four-way stops cautiously, using them only at intersections with a high rate of right-angle accident frequency.

Our budget on signs and markings has increased from $30,000 a year to $100,000 during the last three years.

Parking

Parking has been removed from all streets in the downtown business area where streets are thirty-six feet wide or less. Parking has further been removed from all main arteries entering the City.

Within the last two years, the city has installed over 1000 parking meters in the central business district and areas adjacent as a step toward increasing parking facilities where they are most needed. These 1000 meters are only the beginning of a program which is now estimated to reach a total of 4000 to 5000 meters.

Parking meters are installed only on those streets where traffic studies have indicated a need for short-time parking. Some 12-minute

meters are being tried at present in front of downtown banking establishments.

All the revenue from parking meters is earmarked for traffic improvement under Chapter 19, Section 16 of the General Ordinances of the City of Louisville, which reads in part as follows:

". . . said fund shall be disbursed upon the order of and under the direction of the Board of Aldermen for the following purposes only and in the order named: (1) For payment of the purchase price and installation of said meters; (2) for maintenance operation, repair and replacement of said meters, and collection of deposits therein; (3) for regulation and control of parking on the streets of the City of Louisville, including traffic engineering and enforcement; (4) for traffic improvements, including the acquisition of off-street parking facilities pursuant to Kentucky Revised Statutes 93.351 to and including 93.356."

Off-Street Parking

The city is fortunate in having broad powers with regard to the control and development of off-street parking facilities as granted by the Kentucky legislature under a well-drawn enabling act. The administration of this program is under the Director of Traffic Engineering.

As yet the city has not exercised the authority granted under the off-street parking legislation, but broad plans are now being drawn up by the city, in conjunction with the Louisville Chamber of Commerce and the City-County Planning and Zoning Commission for full use of the legislative provision, whereby the city could purchase property to be used for off-street parking and operated by the city or some agency to whom the city might lease such property.

Recently the Planning and Zoning Commission has liberalized its zoning laws to make it possible for business firms to own their own off-street parking facilities. Several ordinances are now being drafted making it mandatory for all newly constructed businesses, outside of the central business district, to provide their own off-street parking facilities and off-street loading and unloading bays.

Additional Plans

Among the city's latest plans for improving the movement of traffic are the installation of a number of "No Left Turn" regulations to expedite a through movement of traffic at intersections. We are also forwarding a program of far-side bus stops as a further improvement in the flow of traffic and the safety of pedestrians. If monies are available, the city hopes, further, to extend and connect its present system of traffic arteries by the purchase of additional rights-of-way.

Surveys for Traffic Safety

JOSEPH L. LINGO

Mr. Lingo is the director of Purdue University's Public Safety Institute with the rank of Associate Professor. Under his direction the Institute, since 1937, has conducted an extensive program of services, training and research in the field of public safety. City traffic surveys have constituted an important phase of this program. He has served as Consultant to the U. S. Office of Civilian Defense, as Special Instructor for the Federal Bureau of Investigation, and as Field Representative of the National Safety Council. He is Vice-President of the Indiana Traffic Safety Council and Consultant to the Indiana Traffic Safety Commission.

IN THE development of present day traffic control and accident prevention methods, extensive use has been made of the survey technique. Traffic surveys may be truly called one of the really effective tools of the traffic safety specialist.

Much has been written and spoken concerning the relative values of the various types of traffic surveys and of the techniques used in their preparation. It is worth repeating to say that effective action in traffic safety is based on knowing, finding and fixing the conditions and circumstances responsible for accidents, confusion and costly delays in traffic movement. The traffic survey technique is one of the most valuable and effective means to this end. This technique has been an important factor in placing traffic action programs on a factual basis and in providing a positive solution to many vexing traffic problems.

For the past fourteen years, the Public Safety Institute of Purdue University has made extensive use of the survey technique in its program of services, training and research in the field of traffic safety. During this period, over fifty comprehensive traffic enforcement studies and reports have been completed in the towns and cities of Indiana.

Operating outside Indiana under a Foundation established in 1941 by the National Automobile Theft Bureau, similar traffic enforcement surveys have been completed in cities in Ohio, Iowa,

Michigan, Illinois, Minnesota, South Dakota, New Mexico, Wyoming and Colorado.

In cooperation with the Traffic Engineering Bureau of the State Highway Commission, twenty-eight Indiana towns and cities have benefited through the conduct of more comprehensive traffic surveys in which problems of legislation, enforcement, engineering, education and public support were studied. This activity, conducted without cost to the towns and cities, has provided a unique and helpful service to local communities in dealing with their traffic safety problems.

The statewide assistance program to the towns and cities of Indiana was established to supplement local efforts in dealing with problems of traffic control and accident prevention. The traffic survey technique has been used extensively in this program because it provides the best medium yet found for the study of traffic needs based on factual information about local conditions and problems.

Proved Benefits From Surveys

This use of the traffic survey technique has proved valuable, not only as a basis for making more effective use of existing facilities in various towns and cities, but also to show important trends in local traffic characteristics and demands. Other benefits have included a greater statewide uniformity in traffic control methods, the use of approved traffic operational standards, upgrading of traffic personnel and a greater realization of the value of factual knowledge in dealing with traffic control problems.

From our traffic survey experience of many years, one highly important factor stands out as an indication of real progress. This is the change in attitude on the part of many city officials, police administrators and others regarding the value and use of a factual and scientific approach to the problems of traffic safety. As surveys have been completed in city after city, it has been interesting to observe the changing concepts regarding this important factor in dealing with traffic safety problems. Today, most of our Indiana city officials realize that their traffic demands cannot be met by an approach based on apparent need, complaints and opinion. They know that the

traffic problem is complicated and is not just one but many interrelated problems that call for coordinated answers based on factual information.

This realization, on the part of many progressive city officials and others, is, in my opinion, the most significant result of the entire statewide survey program. It will have far-reaching effects on the future traffic safety activities of every town and city—effects that go far beyond the mere preparation and presentation of a survey report. It is the type of attitude that brings about a sincere realization of the city's responsibility to its citizens in the field of traffic safety.

Due to intangible factors involved, it is obviously impossible to measure accurately results of traffic survey activities on a comparative year-to-year basis. The general trend in regard to traffic fatalities in urban and rural areas of Indiana, as shown in the following table, indicates a decided improvement in urban fatal accident experience:

Year	*Rural*	*Urban*
1943	57%	43%
1944	60%	40%
1945	63%	37%
1946	65%	35%
1947	68%	32%
1948	71%	29%
1949	71%	29%

Another important factor indicated by our traffic survey experience is the necessity for effective follow-up activities on the part of the survey staff or organization. No traffic survey can be considered as more than a mere means to an end and no survey should ever be thought of as an end in itself. The end result—reduction of traffic accidents and congestion—will depend chiefly on the support, interest and activities of local officials and groups.

Follow-Through and Support Are Needed

The responsibility for the development of this support and interest cannot end when the survey is presented. Too often, traffic surveys have been figuratively tossed into the laps of city officials with little

explanation or understanding of what they should do next. In such cases the survey recommendations become choice tid-bits to be kicked around by politicians, pressure groups or persons with some special interest at stake.

Fortunately, in Indiana, it has not been necessary to curtail the service and assistance program when the survey is presented and expect the local officials to accept the survey recommendations and place them into effect. A great deal of time and effort is spent in each city on the necessary follow-up activities. It is estimated that more than twice as much time is required on this phase of the program as is spent in preparing the original survey report.

Much additional staff time is spent in working with local safety councils, traffic commissions, city councils, chambers of commerce, parking committees and other groups in the development of organized public support for the suggested changes. In many instances, our staff have assisted in the actual organization of local traffic safety commissions and other groups.

Many of the survey recommendations must be enacted into ordinances and written into administrative policy directives. This is another important phase of the follow-up activity which cannot be slighted or overlooked.

Over half of the cities surveyed have completely revised their local traffic ordinances and brought them into conformance with the State Vehicle Code and the Model Traffic Ordinance. In all other survey cities this activity is now being given high priority by local law-making bodies. This activity again demands the close study and assistance of the survey staff over an extended period.

The actual training of police officers and other city personnel is a definite part of the follow-up responsibility in every city or town where traffic surveys are conducted. Much of this training is provided through regular facilities of the university and in cooperation with Indiana University, the Federal Bureau of Investigation and the Indiana State Police. Where a certain type of specialized training is needed and cannot be made available through statewide facilities, arrangements are made with city officials to send key personnel to the National Institute for Traffic Training and other recognized training centers.

Another important factor which cannot be overlooked in any statewide program of traffic safety service is the special need and problems of the smaller communities—particularly those under 15,000 population.

When this program of assistance to municipalities was started in 1937, the emphasis was chiefly on the problems in the larger cities of the state. It was felt that these cities would have more interest in attempting to do an effective job because their problems were greater and more apparent. They would, or so it seemed, be in a better position to obtain the necessary personnel, equipment and facilities which are vital in effecting the recommendations of any traffic survey. The problem of municipal finances was also of considerable importance although the local surveys and other services were conducted at no cost whatever to the cities.

Smaller Towns Need Traffic Study

Toward the end of World War II, we began to realize that the traffic problem was also of vital concern to the smaller towns and cities of the state and that many of these communities were anxious to do something about it. This fact was brought more forcibly to our attention upon the completion of a special study in which we compared the number of fatal traffic accidents for 1946 and 1947 in the Indiana cities of various populations. Results of this study are summarized below:

A. Fifty-four cities in the 1,000–10,000 population group, with a combined population of approximately 221,000 showed a 36 per cent increase in fatalities in 1947 over 1946.

B. Seventeen cities in the 10,000–25,000 population group, with a total combined population of 235,000 showed a 3 per cent decrease in fatalities in 1947 over 1946.

C. Twelve cities in the 25,000–70,000 population group, with a combined population of approximately 446,000 showed a 30 per cent decrease in fatalities in 1947 over 1946.

D. Six cities in the 70,000 and over population group, with a combined population of approximately 885,000 showed a decrease of 16 per cent in 1947 over 1946.

The fact that all of the city population groups above 10,000 showed decided drops in fatality totals was evidence that the statewide assistance program was producing results. However, the increase of 36 per cent in fatalities in the large number of towns under 10,000 population and the fact that this was the only group to show a comparative increase over 1946, was cause for serious concern.

While a part of the reason for this result in the smaller towns might be attributed to limited finances, equipment and personnel, we found that certain other factors were also to blame. One of these was the degree of use that was being made of accepted modern practices in the enforcement, engineering and educational activities of the smaller communities. Upon checking this factor, for example, it was found that only seven of the fifty-four smaller towns of the state were making even the least effort to investigate traffic accidents and complete accident reports. Only four filed accident reports by location and maintained accident spot maps in their police departments. Traffic engineering was largely a matter of pressure and apparent need based on complaints and special interests. City ordinances relative to traffic control were outmoded or, in many cases, non-existent.

Acting on these facts, the survey and assistance program was expanded to meet the needs of the smaller communities of the state. While the services to larger cities were continued, major emphasis was placed on the activities in cities under 15,000 population. Although no statewide comparative study of results has been made since 1947, we know that the efforts of the smaller cities and towns are producing many improvements in effective traffic control measures. Direct evidence of this is indicated in the reports submitted each year by the cities under 10,000 population in the Indiana Traffic Safety Contest conducted by the Indiana Traffic Safety Commission. Further evidence is shown by the fact that Peru, Indiana (population 12,432) won top honors for traffic safety in the National Traffic Safety Inventory for 1948 and Huntington, Indiana (population 13,904) won this honor in 1949. In each of these cities comprehensive traffic surveys had been completed prior to their winning the national awards.

Points of Survey Technique

As a matter of actual technique in the conduct of comprehensive traffic surveys in Indiana towns and cities, we have found it expedient to adopt and follow a definite step-by-step procedure starting with a study of local traffic rules and regulations. Following this phase of the survey, studies are made of traffic enforcement activities, traffic engineering problems, safety education, public support and other factors which have a bearing on local traffic conditions.

Each phase of the comprehensive survey is made separately with recommendations being presented as soon as the particular section is completed. Experience has taught us that this method works much better than trying to study and present all phases of the survey at one time. The step-by-step procedure allows more time for follow-up and local action on the respective recommendations of a particular section and also gives us a very good indication of the interest which local officials have in the entire survey project. If this interest lags and local action is slow in regard to the implementation of the recommendations of one section of the survey, no additional studies are made until this condition is improved. For example, no studies are made or recommendations presented on traffic engineering changes until the local officials are willing to accept the basic suggestions enumerated in the sections on legislation and traffic enforcement.

The value of this procedure is apparent when one realizes the inter-dependence of the various elements of traffic safety. All too often the real effectiveness of one-way streets, progressive traffic signal operations, parking restrictions and other traffic engineering activities is lost because of inefficient or inadequate enforcement. Conversely, it is not possible to follow through with factual traffic engineering improvements unless the basic facts are provided through effective accident reporting and investigation by the police.

Although the extensive use of traffic surveys has received some critical comment from certain quarters during past years, it seems apparent that such criticism was justified only as it related to methods rather than to basic principles. In other words, objectivity, in certain cases, has been sacrificed to opinion and adequate adaptations were not made to the specific needs and problems of the community or area being studied.

Five Definite Responsibilities

In my opinion, the conduct of an effective traffic survey in any city involves five definite responsibilities on the part of the survey group: (1) To collect factual information regarding the problems to be studied; (2) To evaluate this information in its relationship to approved standards, practices and local conditions; (3) To prepare, on the basis of this information and evaluation, a series of recommendations for improvements: (4) To encourage city officials and others involved in understanding and supporting the recommendations; and (5) To actively assist local officials in carrying out the recommended changes.

Each of these factors is important in the conduct of an effective city-wide traffic survey. Failure to give proper attention to any one can seriously affect the results of the survey program. When each of these responsibilities is met not only will the city be better able to handle its current traffic problems, but official and public attitudes toward traffic safety will be such as to assure real progress in the future.

It has been stated many times that any city can have about as much traffic safety as it is willing to work and pay for. The methods for accomplishing this objective are well known and need only to be intelligently applied. Our traffic safety problems of today are due not to a lack of knowledge of what to do, but chiefly to a lack of coordinated action.

We need more multipliers and more practice in doing the things which we already know. The traffic survey technique, with adequate follow-up activities, offers an excellent medium for the realization of this objective in the field of traffic control and accident prevention.

Speed

J. CARL MCMONAGLE

Mr. McMonagle is Director of the Planning and Traffic Division of the Michigan State Highway Department. Previously he was Assistant Director and before that was in charge of the Traffic Section of the Highway Planning Survey. Altogether he has been with the Michigan State Highway Department for the last 15 years. He is a member of the Institute of Traffic Engineers, of the American Society of Planning Officials, and of the Michigan Engineering Society. He is a member of technical committees of the American Association of State Highway Officials, of the Highway Research Board, and of the President's Highway Safety Conference.

MOTOR VEHICLE transportation has two qualities which, because they satisfy the demands of our mobile and individualistic tastes, have brought about a basic revolution in the pattern of American life.

These two qualities are flexibility of service and speed of operation. They make it possible for an individual, people, or goods to move or to be moved between practically any desired terminals at practically any desired time with convenience and dispatch.

The initial credit for this transforming development goes, of course, to the automotive inventors and manufacturers who have equipped the American people with huge numbers of cars, trucks, and buses. These vehicles have high over-all efficiency, are rugged in service, and have speed potentials to meet all practical requirements.

In their turn, highway engineers and agencies have designed and built extensive systems of roadways and structures which, though frequently falling short of complete adequacy, are generally dependable. Daily usage proves that these highways enable the motor vehicles to deliver an extremely flexible transportation service. However, it often happens that the speed of the units performing this service generates frictions which create confusion, hazards, and conflicts.

On modern highways these problems do not arise from any lack of attention to speed as a factor in the design of the facilities. Design

speed is a basic specification for the selection of design standards appropriate for traffic. Many design features have been introduced or revised to accommodate the higher rates of travel that have become common.

But this consideration of speed as a determinant of design has not secured completely satisfactory results. From the very start, the operation of traffic has revealed that speed introduces certain conflicting relationships into the traffic stream which have not been and perhaps cannot be compensated for by design features alone. There has been a constant attempt to cope with these conditions by restrictive or regulatory statutes and engineering controls.

Shifting Views on Speed

In the earliest days of the automobile, speed was its most publicized feature. Car owners were delighted that their cars were faster than the former means of highway transportation. For the same reason, the far more numerous class of non-owners found the automobile a menace to order and safety to travel and demanded and obtained the enactment of blanket laws severely restricting speed.

Naturally these unreasonable restraints on the growing utilization of the new type of highway travel were deeply resented by the motorists and manufacturers. Nevertheless, for several years they had to content themselves with occasional infringements of these laws and a steady barrage of remonstrances against them. As these protesting groups rapidly gained in numbers and influence, they looked about for more effective measures for getting rid of the restrictive handicaps.

Relief came from the establishment of the traffic engineering profession which came into being because automobile usage, growing in spite of all restrictions, created a multitude of actual traffic problems. Here were men who, as acknowledged specialists in all matters pertaining to traffic movement, could be cited as experts on the subject of speed. When some unknown traffic engineering pioneer came up with the pronouncement that "Speed, per se, is not a causative factor in accidents," it seemed to the opponents of current speed restrictions that this was just what the doctor ordered.

Although during a considerable period this statement cropped up frequently in the literature on traffic and safety, it was soon modified to its present form: "Speed is only dangerous relative to attendant conditions." It is fortunate that the original dictum was never fully accepted as a basis for traffic control policy, for it was a dangerous mis-statement of fact.

Speed and Accidents

There are dozens or perhaps hundreds of contributing factors to traffic accident occurrence, but speed and speed pretty much alone is the basic essential factor. From the physical point of view, the truth that without velocity a vehicle cannot collide with another or run off the road, is so simple and obvious that it requires periodic restatement.

It is equally true that the accident potential increases at some power of the speed, at present not mathematically determined. But the important thing is that, regardless of whether the ratio is as the square, the cube, or the nth power, 70 miles per hour is more dangerous than 50, and that both are more dangerous than 30 miles per hour.

As far as the driver is concerned, the higher the speed, the less time he has to perceive, to judge, and to act regarding a traffic situation. At the same time, the range of his peripheral vision, which extends almost 90 degrees on either side when at rest, is progressively narrowed with increased speed and is cut to only 40 degrees at 60 miles per hour. Moreover, his accustomed rhythms of car operation cause violent exaggerations of vehicular movement when he performs such common maneuvers as overtaking and passing at the highest speeds.

These are not merely theoretical considerations: they work out in the practical operation of traffic. In 1949 on Michigan rural highways, 5.6 per cent of accidents involving speeds of more than 50 miles per hour were fatal accidents while less than 2 per cent of accidents had fatal consequences when speeds were under that figure. Also, of the 516 drivers in fatal accidents who were guilty of violations, 274 or 53 per cent were cited for excessive speed.

Of course those who favor the de-emphasis of speed as an accident factor can point to the fact that the majority of total accidents occur under lower speed conditions—speed increases the severity of accidents, they explain, but it does not cause them. However, it should be remembered that in the great bulk of minor conflicts, the significant condition is not speed but exposure. In any case, the question may well be asked whether dented fenders or dented heads are the really vital statistics of traffic hazard.

Needless to say, the purpose of this retraversing of an ancient battlefield is not the re-establishment of unreasonable and discredited restrictive measures. The inapplicability of such inflexible limitations to the diverse and fluid conditions of modern highway traffic has been thoroughly demonstrated. The immediate purpose is to counter the tendency in some quarters to completely absolve speed from any but the most remote complicity in accident causation. The ultimate objective is to impress the fact on the serious students of traffic operation that speed remains one of the central factors in the operation as well as the safety of traffic.

Traffic Order and Traffic Speed

The problems created by speeds have other facets than those connected with hazards and accidents. One of these is the effect of speed on orderly traffic movement. Among the potent sources of confusion and of potential hazard on the highways are the wide differentials between the speeds of the various units in the traffic stream.

On an average highway, speeds ordinarily range from the zero movement of the parked vehicles to the flashing pace of the fastest cars. On city streets the higher speeds are practically eliminated by statutory limits and rates within the permissible range are brought into further uniformity by various other types of control. But in other areas the maneuvers by which the differing speeds of moving vehicles are adjusted to the limitations of a single roadway are often productive of conflicts and always tend to break into the completely orderly flow of the traffic stream.

This relationship between widely diverse speeds and both orderly traffic movement and traffic safety is graphically illustrated by the

traffic and accident statistics of the past ten years. Michigan data are used, but the trends revealed closely approximate those in the nation at large.

During the period 1940 to 1949 inclusive, there has been an important over-all change in the speed habit of Michigan motorists. This change is shown in the following data from studies of speed on the state trunklines for three selected years during this decade.

PERCENTAGES OF TRAFFIC IN SPEED RANGES

	Under 35 mph	*Between 35–50 mph*	*Over 50 mph*	*Average Speed*
1940 (pre-war)	7%	44%	49%	50 mph
1943 (wartime)	22%	73%	5%	41 mph
1949 (postwar)	6%	57%	37%	51 mph

As the above figures show, the important change in speeds from 1940 to 1949 was not in the average rate which had a very moderate rise of from 50 to 51 miles per hour. It was in the grouping of traffic in the three typical speed ranges. The expansion of the middle range to include 57 per cent of all vehicles in 1949 rather than the 44 per cent of 1940, is believed to be significant. So is the corresponding shrinkage of the percentages in the two extreme ranges particularly the nearly one-quarter reduction in the percentage of the faster component.

It may be noted that the 1949 distribution pattern appears to be a partial readjustment from that of 1943 when the 35 mile wartime speed restrictions were in force. This 1949 pattern may also reflect the more crowded conditions on the highways resulting from the 38 per cent increase in traffic in the ten-year period. But whatever the cause, the condition has significant implications with regard to traffic order and perhaps to traffic safety.

This grouping of a larger proportion of the units in the average traffic stream in a fairly compact speed range with fewer cars traveling extremely fast or extremely slow, should mean that there is increased regularity and orderliness in the flow of traffic. Since it is the minority groups of slowest and fastest cars which cause or perform the majority of the overtaking and passing maneuvers and since this maneuver commonly exposes vehicles to danger of conflict, there

also should be an accompanying improvement in the safety characteristics of traffic.

If, as the logic of the data seems to indicate, the last named effect is produced, it may be counted as a factor contributing to the marked reduction of the rate of accident fatality occurrence during this period. In 1940 this rate was 11.85 per 100 million vehicle-miles but, after a sharp bulge in 1941, it declined practically without interruption during the following nine years and was down to 7.14 traffic fatalities per 100 million vehicle-miles in 1949.

Unquestionably other factors played as great and probably a greater part in bringing about this favorable reversal in the occurrence for the more serious accidents. Among these factors traffic engineering measures, particularly those pertaining to speed control, are of special importance.

Purposes and Legal Framework of Speed Control

Because of the primary and essential importance of speed to motor vehicle transportation, highway and traffic engineers try to provide for and protect it within the broadest practical limits.

Design features relating to pavement dimensions, structural and surface texture, alignment, and super-elevation of curves, are combined to meet the requirements of the physical laws of motion. But beyond these are occasional roadside and traffic conditions where safety and order demand operational controls. Speed zoning is the method best suited to apply control to those locations where it is needed and to limit its application to them.

In considering the whole subject of speed control, it is evident that engineering operations must take place within the framework of the laws governing these matters. Statutes regarding general speed restrictions and the establishment of speed control zones vary widely from state to state.

Michigan, with whose conditions this paper is principally concerned, has an exceptionally good statutory set-up which permits great flexibility of operation and control. The basic speed law sets up no absolute general speed limit but requires that vehicles shall be driven at rates safe for conditions. A 25-mile per hour limit is set

for urban business and residential districts, but local authorities are empowered to set higher limits outside those districts and also within them, provided the affected arteries are designated and posted as through streets. The state highway commissioner is given similar authority regarding trunkline streets outside the business district.

Another act authorizes speed zoning on all trunklines by the joint action of the state highway commissioner and the commissioner of state police. Acting together, they are given authority to establish, after investigation, regulation of parking, speed, and traffic within zones designated by them. A companion act gives like authority to county road commissions acting with the state police commissioner.

These acts cover most possible conditions and afford much latitude for reasonable operation by both drivers and traffic control authorities. Acting under them, the State Highway Department and other highway and enforcement agencies have had much experience in the devising and application of speed controls.

Factors in Effective Control

Studies of traffic operation in speed control zones have yielded widely diverse results regarding the degree of compliance they obtain. Frankness also requires the admission that analyses of accident experience before and after the installation of such zones reveal very mixed results that are far from conclusive evidence of their invariable effectiveness.

Nevertheless, the weight of experience and proof points to the fact that in locations that are properly chosen, with accurately selected limitations, and with correctly designed installations, the speed control zone is an efficient tool for improving traffic order and safety. This conclusion puts the responsibility for meeting these conditions squarely up to the traffic engineer.

Michigan is now conducting an extensive study of accident occurrence in relation to those factors which have been found basic in the establishment of speed controls. Early results have given some indications of the relative importance of certain roadway and roadside features in creating confusion and hazard in the traffic stream. Further observations and analyses will probably add more definite

information that will aid in dealing with speed control and other traffic problems.

The state is also gathering much sounder data concerning speed itself. The State Highway Department is now conducting its periodic speed observations with a radar speed meter. This instrument, which is accurate within two miles throughout its range, is also being used in surveys preliminary to the establishment of control zones.

Investigations are in progress in several states to determine and evaluate the various conditions which could be accepted as warrants for the establishment of speed control zones. The work in Michigan has reached the point where it is known that the characteristics, respectively, of the roadside, the roadway, and the traffic are the decisive factors. So far, however, little real progress has been made toward finding a formula for computing the respective values of these factors.

It appears at least possible, that traffic engineers are heading up a blind alley when they seek to formulate their consideration of speed control problems into too hidebound a procedure. The elements of the problem differ widely as between locations and are often themselves unstable and changing. Not only may it be impracticable to reduce the weighting of these elements to a formula; it may be highly desirable that the traffic engineer retain flexibility of action to match the variety of conditions with which he must deal.

General knowledge and experience regarding speed and speed control are accumulating. They already are sufficient to form the basis for general policies in this field. But the time will never come when it will be unnecessary to make thorough investigations of the specific conditions in each particular location and to apply informed and experienced judgment to the results.

The setting up of control zones is still a somewhat experimental and tentative process, and the responsibility of the traffic engineer does not end when a zone has been established and posted. Careful observations of the operation of the zone are required to check on the design features and to keep abreast of the changing traffic conditions. Sometimes it is found that there is need for a change in the design and sometimes this rechecking process reveals the need for increased enforcement pressure.

Enforcement is undoubtedly an essential partner in successful speed zoning, as it is in other phases of traffic control; but it should be the objective of the traffic engineer to keep it, as far as possible, a silent partner. In other words, he should strive by the techniques of his profession to gain the cooperation of the driving public to a degree where enforcement will be only an ultimate recourse.

Public observance is won by convincing drivers that the aim of the regulations and controls is to put traffic through the restricted zone at the highest rate of speed consistent with conditions. In the field of speed control zoning, this can best be done by increasing our knowledge of the factors which make speed dangerous and by perfecting the methods for controlling it.

Conclusion

Speed is one of the great essential benefits which make highway transportation indispensable in modern America. It must be provided for and protected. But in planning for the accommodation and preservation of this primary benefit, highway and traffic engineering must work with the full realization that it is also a dangerous benefit. As long as that knowledge is lacking or there is a tendency to camouflage the fact behind compromising definitions, there will be difficulty in arriving at either sound understanding or effective solutions of speed problems.

Connecticut's State Police

COMMISSIONER EDWARD J. HICKEY

Commissioner Edward J. Hickey has been Commissioner of the Connecticut State Police since July 1, 1939. Engaged in law-enforcement since 1915, his experience includes private detective work with the Pinkerton Agency, Special Agent with the U. S. Department of Justice, and the Office of U. S. Naval Intelligence; State Detective, Connecticut State Police and Hartford County Detective. He was Regional Chairman (Atlantic States) State and Provincial Section IACP 1941–1942 and three times was selected chairman of the State and Provincial Section IACP serving in 1943, 1944, 1945. He was also a member of the National Advisory Committee to the War Department. He was twice elected President of the Connecticut Chiefs of Police Association in 1944–1945. He is a member of the Executive Committee of the State Police Association of Connecticut, an active member of the New England Police Chiefs Association, and of the International Association of Identification.

THE Connecticut State Police Department, established in 1903 to provide detective service to state prosecutors and coroners, has far outgrown its original purpose.

And to this department in 1948 the International Association of Chiefs of Police awarded a First Place Award[1] for effective traffic *enforcement*. At the same time the National Safety Council awarded first national honors to the state police of Connecticut for traffic *safety*. Again in 1949 the IACP repeated its First Place Award to Connecticut. Recent Uniform Crime Reports of the F.B.I. give Connecticut one of the lowest crime-incidence figures of the nation.

What is the secret of the success of this organization in those two fields—criminal and traffic? There is no secret. Progress has been made in policing through willingness to adapt modern methods to modern conditions.

The foundation for the strength of our department today was established through the flexibility of the authority bestowed by act of legislature in 1903. This act granted full police powers throughout the state to state policemen.

[1] A tie with Pennsylvania.

Other statutory provisions require that . . . "the commissioner of state police shall designate one hundred men for motor patrol work exclusively." Further that . . . "said commissioner shall devise and make effective a system of police patrols throughout the state, exclusive of cities and boroughs, for the purpose of preventing or detecting any violation of the criminal law or any law relating to motor vehicles and shall establish and maintain such barracks or sub-station as may prove necessary to accomplish such purpose."

Today's Connecticut State Police organization is a far cry from the unit that was organized in 1903 with a force of five men. The last budget granted to the organization to operate for a two-year period was nearly four-and-a-half million dollars. The department is a big business with an authorized strength of 300 policemen, 10 resident officers, 12 policewomen, 173 civilian employees and an inventory of more than 375 vehicles including 338 patrol cars, 12 motorcycles, two jeeps, 10 emergency service vehicles, 6 ambulances, and 7 utility vehicles.

Crime and traffic are both as old as the world itself. Yet, as times change, new criminal and traffic patterns develop that must be controlled by changing police methods. The automobile, airplane, radio and telephone were unheard of in the commission of crime before the turn of the century. Now they are used by criminals and police alike. In keeping pace with developments, the Connecticut State Police, keeping a balance between past and present, have continuously forged ahead in crime and accident prevention work.

Duties of Commissioner Now Varied

At one time the department operated under a board of five commissioners. This was later reduced to a three-man commission. In 1927 the department was placed under the direction of a single commissioner appointed by the Governor for a term of four years, without recourse to either branch of the legislature for approval. This means the head of the State Police Department is responsible to the governor only, to whom he makes monthly and annual reports of departmental activities.

By way of other duties, the Commissioner is State Fire Marshal.

He is specifically charged with the enforcement of laws relating to amusement park licenses; investigation of the origin of fires; abatement of fire hazards; approval of make and type of fuel oil burners; inspection and regulation of moving picture theaters; licenses to managers of motion picture theaters; licenses to projectionists; storage of film; enforcement of outdoor advertising law, and the jewelry auction law. He makes and enforces regulations concerning manufacture, transportation and use of explosives. He is the fuel emergency authority. He issues pistol and revolver permits, assists in the enforcement of aeronautic laws and is coordinator of State Civil Defense.

The department is definitely distinct from all other departments in the state government, although the law requires it to assist the Department of Motor Vehicles and some other departments if and when necessary. The most important connection it has with other departments arises through a law that provides powers and duties of the State Traffic Commission. This consists of the Highway Commissioner, the Commissioner of Motor Vehicles, and the Commissioner of State Police. These powers include the regulation of speed of motor vehicles and the abatement of traffic hazards.

Noteworthy Progress in Last 10 Years

The progress made by the Department of State Police during the past ten years has been especially noteworthy.

Control of the patrolmen in the field was loose prior to 1940. As the services of officers on patrol were required, a telephone call to a gasoline service station on the patrol route usually resulted in the attendant's watching for the cruiser and flagging it down to relay a police message. In 1940, utilizing the services of Dean Daniel B. Noble, of the University of Connecticut, and of state police radio technicians, the department put into operation the first police frequency modulation radio system.

The departmental communications system, instituted in 1940, now reflects efficiency and speedy dispatch of police information throughout the state and inter-state via teletype and radio. With more than three dozen teletype machines in operation today, the

department had only one in operation at headquarters a decade ago. Then, all communications were relayed from the Motor Vehicle Department.

In other days, the State Fire Marshal's Office was subordinated to inspection services. It wasn't until 1947 that the Legislature passed the Connecticut Fire Safety Code which made this division a foremost enforcement agency concerned with fire safety.

There were no emergency units connected with the State Police prior to 1939. Today's emergency equipment, manned by trained personnel, consists of special vehicles with proved equipment for use in emergency cases. Heavy-duty wrecker units, rescue boats, ambulances, jeeps and sound amplifier units are ready to move at a minute's notice.

Use of Radar, Photography, and Identification

Connecticut was the first state to use radar for police traffic work and one of the first to experiment with the use of a helicopter for traffic control and criminal apprehension. The state patrolmen in oxford grey uniforms trimmed with blue and topped by a uniform sombrero do much to help Connecticut win frequent traffic and pedestrian safety awards. Connecticut has won the Grand Award in the National Traffic Safety Contest sponsored by the National Safety Council five times since 1944.

Take the matter of photography, used extensively in both criminal and traffic work. A decade ago, police photography was done in a haphazard manner and its effectiveness was lost in the courtroom. Today, qualified police photographers take pictures which become integral parts of the police case file.

In 1940, the State Police identification system had no standing as such—the handling of evidence was a matter of individual choice. In 1941 the State Bureau of Identification was established by law for official scientific analysis of evidence and for keeping police records. All the latest instruments for scientific criminal detection are available for use in criminal or traffic cases. As a fingerprint may lead to solution of a murder case, so may a few head hairs and specks of blood on the undercarriage of an auto lead to the solution of a fatal hit-and-run motor vehicle case.

The Electronic Speed Meter is being used to make a speed survey on the Merritt Parkway.

Emergency units of this type are maintained at several stations ready for immediate assignment.

Traffic towers are operated at many busy intersections during peak traffic periods. This tower, located at the Route 7 feeder into the Merritt Parkway is equipped with radio and a loudspeaker for traffic control.

William Greene (left) director of the State Highway Safety Commission and Capt. Ralph J. Buckley, commander of the State Police Traffic Division, discuss safety problems on a high accident route.

The class of men who enforce our laws has changed over the years, as have our system and equipment. Fifty years ago, law enforcement was largely a matter of dealing with vice and illegal liquor places, thugs, thieves and a few murderers. Only fearless, hardboiled officers could handle such characters and the treatment of offenders was resultingly rough.

Today the police find themselves responsible not only for law enforcement, but also for crime prevention and all kinds of public service. This service includes such varied activities as locating lost persons and stolen automobiles, settling family and neighborhood quarrels, locating and caring for lost children, investigating motor vehicle accidents, rendering first aid service and even to assisting at births in emergencies.

A new era as far as departmental personnel is concerned was opened when the merit system (civil service) was applied to the State Police Department in 1937. Today's rookie is selected from the cream of Connecticut manhood, chosen only after successful participation in written, physical and oral examinations.

Nearly a thousand applicants took a recent examination for the position of state police patrolman. The examination was in four parts: experience and training, written, physical, and oral. It was set up entirely by the state personnel office. As a result, the class that attended the State Police Training School was a group above average in deportment, background, and intelligence as well as in physical condition. Their status as State Police Patrolmen trainees entitles them to annual pay of $2100 plus maintenance for their first year of service.

Subjects Studied in Training Program

During three months of intensive training at the school, the students study the following subjects for the hours listed:

General Education: How to Study, 2; History of Policing, 3; Public Speaking, 12; Standards and Ethics of the Department, 5; and Geography and Civil Government, 7 hours.

Law and Legal Procedures: Traffic law, 25; Criminal Law, 30; Law of Arrest, 10; Rules of Evidence, 15; and Courts and Court Procedures, 15 hours.

Traffic Control, Accident and Criminal Investigation: Accident Investigation, 30; Traffic Direction and Control, 5; Scientific Aids to Investigation, 22; Interrogation of Suspects and Witnesses, 6; Reports and Records for Case Preparation, 20; and Criminal Investigation, 15 hours.

Public and Interdepartmental Relations: Public Relations, 5; Motor Vehicle Department, Licensing, 5; Safety Education, 5; Traffic Engineering, 3; and Interdepartmental Relations, 8 hours.

Skills and Physical Education: First Aid, 20; Motor Vehicle Maintenance and Operation, 38; Handling and Use of Fire Arms and Emergency Equipment, 25; Operation of Communications, 8; Physical Education and Military Drill, 50 hours.

One hundred and fifty hours are devoted to field study-trips during the training period.

After satisfactory completion of the training course, the trainee is assigned to the field for further experience. He is a probationary officer for the next nine months.

One of the things the new officer takes with him when he leaves the training school is the spirit of the Code of Honor of the Connecticut State Police:

> "I am a Connecticut State Policeman—a soldier of the law. To me is entrusted the honor of the Department.
>
> "I will serve the State of Connecticut honestly and faithfully and, if need be, lay down my life as others have done rather than swerve from the path of duty.
>
> "I will be loyal to my superiors, obey the law and enforce the law without discrimination as to class, color, creed or condition, and without fear or favor.
>
> "I will help those in danger or distress, and at all times conduct myself so as to uphold the honor of the Department."

After the graduate is sworn in, he is issued the equipment which becomes the tools of his trade: badge, gun, handcuffs, whistle, uniform, Sam Browne belt, puttees, flashlight, notebook, flares, raincoat, boots and radio equipped patrol car. When he signs a receipt for all the items of his issue, he becomes one of the best-equipped policemen in the country—ready to operate under any conditions.

When the probationary state policeman is assigned to a station,

he becomes familiar with all the equipment used in public service work. Special equipment includes wrecking and rescue units, boats, grappling hooks, resuscitators, ambulances—all on a standby status.

It makes no difference what time of day, how many hours he has already put in on the job, how foolish a question may seem, he must be courteous—but firm, tactful and alert.

Three hundred state policemen and ten policewomen are not very many when spread throughout the state, that's why each man keeps his station advised concerning his location after he leaves it following his regular tour of duty. A policeman twenty-four hours of the day, he is on call at any time he is not actually on duty.

In-Service Training and Selective Enforcement

The patrolman's training doesn't end after his graduation from school. After all, he learns only the fundamentals of police work in the classroom, the rest is learned only through experience in the field. Each officer is required to spend a specified minimum number of hours during the year on in-service training concerned with criminal work, traffic policing, marksmanship, civil defense and first aid. During the year all men, uniformed or plainclothes, go back to school for several days to attend classes featuring instruction in late methods and equipment.

Selective enforcement (as discussed in the *Traffic Quarterly* for April by Chief John M. Gleason) is one of the basic action efforts of the Connecticut State Police Department. To accomplish this end, all motor vehicle arrests and reports as well as accident reports are analyzed by the Traffic Division at Headquarters, composed of graduates of the Northwestern University Traffic Institute. Recommendations of the Traffic Division head may be followed by a radar speed check on a certain highway and then assignment of fifteen members of the division to special patrol in that area.

No so-called "speed traps" are maintained by the department since radio and newspaper publicity precedes the assignment of the squad of traffic specialists and well-marked cars are used in an effort to obtain public cooperation in such life and property protection ventures.

No real advancement can be expected in highway safety and crime prevention without the whole-hearted cooperation of the public. This is the reason the Connecticut State Police take every opportunity to speak to the public through the medium of the press and radio. That is the reason we maintain hook-ups with commercial radio stations for presenting twice-daily broadcasts under the title "Tips from The State Police."

On the highway, State Police cars are well marked so that the driving public will note the presence of the officer. Most persons whose minds may not have been on their driving at the moment, on sighting an officer in his car, are brought back to reality and immediately check their driving. This is preventive policing and is often sufficient to keep the average citizen driving properly.

However, a small minority take advantage of the officer in the marked car and drive properly only when the officer is nearby. The actions of this small minority, usually those with bad driving habits, make it necessary at times for the police to resort to unmarked cars to stop the habitual violator. When un-marked cars are used on patrol, many citizens fail to understand the reason for such action. An understanding of the reason for such action on the part of police would be another example of public cooperation in an effort to combat the common problem of the accident-prone and violation-prone driver. Highway safety demands cooperation at all times. The police act only when individuals, pedestrians and motorists fail to cooperate.

Records Show Results

State Police activity is reflected in the records covering the fiscal year that ended June 1949. During the year 15,200 complaints were handled. There were 2,955 criminal arrests and 8,062 motor vehicle arrests. Criminal arrests showed a 10 per cent reduction, while motor vehicle arrests increased slightly. State Police officers issued a total of 50,131 motor vehicle warnings. Of these 19,296 were for defective equipment. There were 2,700 fewer warnings for defective equipment as compared with the previous year, reflecting the larger number of new cars on the road. General services for the year totaled 15,276, including 851 lectures, radio talks or demonstrations, 1,023

escorts, 43 missing persons searches, and 799 injured or ill persons transported in cars or ambulances. Of the 4,176 auto accidents investigated by State Police officers during the year, 76 per cent resulted in an arrest or warning. This represents a 4 per cent decrease over the previous year when 4,419 accidents were investigated.

How the Point System Works

Cooperation between the State Police and other organizations interested in safety such as the State Highway Safety Commission, Motor Vehicle Department, Highway Department, Education and Welfare Departments and local agencies is on a friendly, effective level.

The police play an important part in maintaining the effectiveness of the state's driver "point system." This system was established three years ago when statistics revealed that 20 per cent of Connecticut's drivers caused more than 80 per cent of its accidents. To spot accident-prone drivers and correct their faults where possible, the state has put all of its drivers on a report card basis. Each traffic violation is entered on the driver's record in the Motor Vehicle Department's master file. A police warning puts one demerit on the record; running through a Stop sign counts two; speeding three, and so on up to the top penalty of 10 points for drunken driving or for being half responsible for a highway fatality.

When a driver accumulates three points or demerits, he receives a warning letter. Phrased in a friendly way, it urges him to improve his driving habits. Drivers who accumulate a total of five demerits are called in for an informal conference. If the total reaches six points, the motorist is summoned to a formal hearing and punishment is inevitable. Usually the penalty is loss of license. This system helped Connecticut in 1949 establish its lowest auto fatality figure in sixteen years.

When all the factors are considered, there is no one reason that may be cited as responsible for the success of the Connecticut State Police. Its far-sighted leaders and the spirit and morale of its men and women carry it high among the ranks of similar departments in the nation.

Effective Safety-Council Programs

JOSEPH M. KAPLAN

Mr. Kaplan is Manager of the Greater Los Angeles Chapter of the National Safety Council. He is a graduate of the Harvard Bureau for Street Traffic Research and he served as a military safety engineer at Camp Roberts during the war. He is a member of the American Society of Safety Engineers and a Charter Member of the Los Angeles Chapter of the Southern California Industrial Safety Society.

NO SAFETY-COUNCIL manager is operating what he would call "a completely effective program." No matter how good the balance sheet of accomplishment at the end of the year, he will admit there is much yet to be done. For this business of safety is a never ending one. There is always another base to cover, another step to take, stretching away in a vista of activity—a constant challenge to our ingenuity, sometimes to our lagging spirits.

An effective local safety-council program covering the entire safety front can become the well-greased axle on which the wheels of safety activities in any community turn. This is much to be desired, not from the standpoint of the safety council alone, but from that of the community as well. For ours is an economy of thrift, efficiency and production that has no place for ineffective leadership, poor planning, and profligate spending. Particularly is this so with regard to a non-profit, public service organization such as a safety council, which must discharge its responsibility both wisely and well.

In fact, to go back to the well-greased axle, we believe that the real effectiveness of any safety council program can be gauged by determining how close it comes to being the hub assuming the leadership and direction of all safety activity in the community. This is no easy goal. But it should be the objective of all worthy safety councils.

Trying to be objective about something as subjective as our own progress is asking the camel to pass through the eye of the needle. However we report best what we know best; so let's examine our program last year in Los Angeles.

We are a long way from our goal. Becoming the hub and motivat-

ing force for the safety movement in an area as big, as diverse, as active, as fast-growing as Los Angeles is a tremendous task. We are a city of approximately two million, sprawling over an area of 453 square miles. Our industry is expanding faster, and our homes are being built in greater numbers, than in any other community in the nation. We have a larger per-capita registration of automobiles than any other city in the world. Every twenty-four hours sees an ingress and egress of over 900,000 cars to and from the metropolitan area.

This simply by way of indicating that complete integration of the overall safety program here, with the Greater Los Angeles Chapter of the National Safety Council as its prime mover, presents a rather complex, but nonetheless solvable, problem.

Inasmuch as most of the work carried on by the safety council is voluntary, we needed first a rather broad and extensively representative base. We have been building toward this for some time, and last year and this, our volunteer participation in numerous divisional activities was the strongest, most enthusiastic and most active it has been yet. Only those activities that directly relate to traffic will be discussed here, but it can be said that our program in Los Angeles is an all-embracing one with other divisional activities in motion on Industrial, Home, Air, Fire and Marine safety.

"Operation Safety"

Our volunteer groups, actively conducting our monthly "Operation Safety" program include such organizations as The Junior Chamber of Commerce, The Advertising Clubs of Los Angeles and Hollywood, The Boy Scouts of America, the Southern California Automobile Dealers Association, the Downtown Businessmen's Association, various service clubs such as Rotary, Optimists, Toastmasters and others, A.F. of L. and CIO, American Legion and VFW. Working in cooperation with the Los Angeles Police Department and the California Highway Patrol, who supply statistics, films and speakers and who extend themselves to the fullest degree in the promotion of this traffic education program, one of these groups sponsors "Operation Safety" each month of the year. Their job is to serve as a public information disseminator, using the Operation

Safety kit supplied by the National Safety Council as a modus operandi, but by no means confining themselves completely to it. Our most effective campaigns as a matter of fact—those that have caught on best with both the reading and listening public, and with newspapers, radio and television stations—have been those in which originality and ingenuity took the lead.

To the extent that we have implemented a solid representative section of volunteer groups, and serve as the coordinating and expediting office where the volunteers and the regularly established enforcement agencies join forces in a continuous traffic educational program, we have an effective traffic safety program actively under way.

At this juncture, we feel constrained to bring into the picture our fleet division activities, which are an integral part of any effective traffic safety program. Our fleet transportation division, one of the largest in the country, each year sponsors a fleet contest. Annual awards are made to those participants in the various classifications, who have the lowest accident frequency rates, based on the number of accidents per 100,000 miles driven. Last year we had 124 fleets, operating 14,370 vehicles, who drove 247,808,524 miles, with an accident frequency rate of 5.23. Seven of the 124 participating firms went through the entire year without a single accident.

We feel that the contest, our continuous educational campaign, and the appearances at our regular monthly meetings of national authorities on transportation and traffic, play a major part in the overall traffic safety picture. A well-trained professional driver, rewarded in many instances by the individual companies for safe driving, and part of the team working for an award for his company, most assuredly contributes towards exemplary driving conduct.

Los Angeles last year established a twenty-three-year record in the reduction of traffic fatalities—fewer persons killed than in 1926 when the problem was nowhere near the complex, aggravated situation it is today. It is no secret that this is due in great part to the excellent work being done by our enforcement and engineering agencies. The creation of one-way streets, the installation—a never ending process—of traffic signals and proper lighting equipment, the widening of streets and highways, have contributed to our continuing downward trend in traffic accidents and fatalities.

L. A. Traffic Division at Work

Our traffic division of the Los Angeles Police Department is generally considered one of the finest in the country. This is equally true of the California Highway Patrol. A credit not only to the men who direct their activities, and the officers who enforce their policies, but more important, a tangible credit in lives saved on the ledger where the traffic tally is inexorably written. Under the policy of selective enforcement, concentrating its traffic police where the most accidents are occurring, and paying particular attention to primary causes of accidents, our traffic division is doing a remarkably effective job. The men are hand picked, the cream of the entire department, and undergo thorough training directed by as good men as there are in the business. Appearance, actions, and record prove it.

The Department also maintains a Traffic Education Unit that is unquestionably one of the finest. The films they prepare themselves, or those on which they serve in advisory capacities, must be listed among the best on this subject on the Pacific Coast. The unit compiles statistics and facts, makes surveys, prepares charts and literature of all descriptions, making it all readily available for public information and public relations. Members of the unit speak, show pictures at service clubs, churches, schools, or wherever the opportunity presents itself. They are a credit to their department and community. They must be counted in the forefront of those responsible for last year's record.

The Traffic Court at Work

Our traffic court has backed our enforcement officers to the hilt. It has been impartial and just. Above that, it has done a first class job of driver education. Traffic violators in Los Angeles, these past two years, have all heard a forceful, logical, simple lecture on the seriousness of the problem and the necessity for enforcement.

This court has taken the position that this—the only contact with the procedures of justice 99 per cent of our citizenry will ever have—is a very important contact. It has gone to great lengths to make it pay off. Not pay off monetarily, but in understanding, changed attitude, and wholehearted desire of the violator to become a better driver.

This eminently fair and reasonable attitude probably won more friends and influenced more people in the cause of traffic safety than any other single method used. We commend it, and wish more traffic courts throughout the land would follow suit.

A record of this kind is not set by one agency or group alone. It comes as the result of an all-out cooperative effort, with everybody harnessed together pulling towards a single objective. This sets the stage for the part an effective safety council traffic program plays. Primarily it welds together all interested agencies, both professional and volunteer, unites them under a common cause, and sets them in motion toward a common goal. Then it runs down field, and through the means of a continuing public information and education program, brings the public to that receptive, interested and co-operative frame of mind that helps make the goal attainable.

That unequivocally is its complete function. If it sounds difficult of achievement—and let us assure you that it is—its difficulty does not lessen its need nor does it give leave to beg off.

Nor does it in any way take away from, or take credit for, the work that police, courts, traffic engineers and highway patrols do in any locality.

The safety council that even partly performs the functions outlined here will certainly become the axle referred to in the beginning. And it will be welcomed with open arms by the entire community.

Parking Plans for Providence, R. I.

FRANK H. MALLEY

For the last five years Mr. Malley has been Planning Director of the Providence City Plan Commission. Before going to Providence, he was for several years Executive Director for the Boston City Planning Board. During Mr. Malley's service, the Providence City Plan Commission has developed master plans for land use and population distribution, for redevelopment of residential areas, for thoroughfares, and for public school sites; also a new zoning ordinance for Providence. Mr. Malley is president of the New England chapter of the American Institute of Planners; and recently chairman of the city planning division of the American Society of Civil Engineers. He is a member of the Institute of Traffic Engineers and of the American Society of Planning Officials. He is a registered professional engineer in Massachusetts and Rhode Island. Mr. Malley directed the preparation of a Six-year Capital Improvement Plan now being published.

THE CITY of Providence, Rhode Island, approached the problem of off-street parking to stabilize central business district values by applying land-use economies in conjunction with traffic engineering. Terminal facilities for vehicles have been accepted as a concomitant with public ways, serving the function of moving people and goods.

Such facilities then have a broader aspect than that of traffic engineering. Indeed, they impinge on many aspects of city planning with which they must be integrated if the facilities are to be sound from both a functional and financial point of view.

During 1945 the State of Rhode Island in cooperation with the Public Roads Administration conducted by interview an origin-and-destination survey and a parking survey in the central business district of Providence. This provided considerable statistical information of traffic volume and parking demand, both numerically and geographically.

Since its reorganization in 1944 the City Plan Commission has published and adopted two master plans with which parking plans

must necessarily be coordinated. They are the *Master Plans for Thoroughfares* and for *Land Use and Population Distribution*. Both were adopted in 1946. Through further cooperation with the State and Public Roads Administrations, consulting engineers were retained in 1947 to develop in greater detail plans for the North-South Freeway. This is the backbone of the master plan for thoroughfares and with its loop around the central business district will carry a large part of the traffic coming into the main shopping center of the metropolitan area. This area has a population of about 700,000 persons.

In 1948, the Commission completed and recommended to the Council a new Zoning Ordinance. Several hearings have been held and the proposed ordinance has been revised in detail by a committee of the City Council. As of September twelfth, 1950, the bill had not yet been enacted. If passed, it would tend to control the growth and development of land use.

Concurrently, various studies for one-way streets, intersection improvements, and channelization were made, since no adequately staffed traffic department was then in existence. In 1949 these studies were taken over and expanded by the newly organized Traffic Engineering Department operating under Dwight T. Myers and Roger Chandler. All of this material, with transit facts (on which some comprehensive study has been made) serve as excellent background for the off-street parking study.

Conferences to Develop a Parking Law

Because of the inadequacy of statutory authority to proceed with parking facility development, the Chamber of Commerce, during the summer and fall of 1948, set up meetings of its Civic Planning and Traffic Board and its Retail Trade Board with the Providence Garage and Parking Lot Association. This was for the purpose of developing an off-street parking bill. The procedure served admirably to resolve the differences of opinion existing among the many groups represented on one or more of these organizations.

The bill so prepared was aimed to maximize private enterprise development and operation. This was in line with the city's policies,

and Mayor Dennis J. Roberts wholeheartedly supported the measure. The General Assembly enacted it as Chapter 2307 of the General Laws of 1949.

This Act provides for the establishment of off-street parking facilities in accord with a comprehensive plan prepared by the City Plan Commission in collaboration with the Redevelopment Agency and the Traffic Engineer. Such facilities were to be financed through *revenue* bonds with a provision for *betterment assessments.* At any point, private operators could step in and carry the ball. The city was prohibited from operating the facilities for more than twelve months at a time and then only if bids for operation would not amortize the investment in a reasonable period. Quite deliberately the Act was made as flexible as it could be drafted in order to be workable under any foreseeable conditions.

Concurrently with the enactment of the law, the directors of the City Plan Commission, and of the Redevelopment Agency, with Dwight T. Myers and John E. Vance, Manager of the Civic Planning and Traffic Board, set up joint meetings of the three departments toward carrying out the purposes of the Act. A joint staff was set up and work assignments were made to the several departments.

The various available plans were reviewed and an economic study of the central business district in relation to the entire city and to the metropolitan district was made. This economic study showed clearly the decentralizing trends of the central business district and the degree to which it was being outstripped by the shopping centers in the whole trading area. This indicated the degree of need for additional off-street parking although unreasonable congestion is apparent without recourse to statistics.

Short-Term Parker Most Important

Detailed land use and valuation maps were related to the supply of and demand for parking. The parking inventory was brought up to date by the Traffic Engineering Department and the demand was made concurrent and projected into the future on the basis of annual cordon counts around the central business district.

We believed that the short-term parker was the most important

customer to satisfy and that he should not be forced to walk more than 600 feet to his destination. All-day parkers could be expected to walk farther to obtain less expensive parking since they have more available time.

The present total deficiency of parking spaces was readily developed from the revised survey figures, and locational design was predicated on peripheral parking adjacent to existing primary circulation arteries and in locations nearby the proposed freeway loop around the central business district. Thus high value areas are kept free for more intensive uses and vehicles are encouraged to avoid this area except for essential movements.

Several factors in the financing of off-street parking facilities, emphasized in our experience at Providence, can be passed along.

Under the 1949 Act the financing of off-street parking facilities through revenue bonds was required. The Act did not, however, establish a parking authority or other such corporate body to be responsible to the bond holders. Revenue bonds have certain advantages over general obligation bonds in that no impediment is placed by them upon the debt structure of the city. Such added debt would more closely approach the statutory limit and make more difficult the sale of other bond issues for necessary purposes.

Revenue bonds are also segregated so there is a direct bookkeeping relationship between them and the income and operating expenses of the facility they finance. The interest on *revenue* bonds—since they are not backed by the entire faith and credit of the city—is higher than on *general obligation* bonds. Consequently a number of financial houses specialize in such bonds and look with considerable interest toward off-street parking.

We expected that before we could market revenue bonds for our needed facilities we would be required to have a review of our plans and procedures by nationally known consulting engineers, as was found necessary, for example, in Pittsburgh. We saw no particular advantage in having two studies and accompanying reports prepared. It was our intent, if necessary, to add a consulting engineer to our combined staff for the preparation of a report. Unfortunately, the reputation of traffic engineers and city planners, who know a great deal about the techniques of evaluating the need for and the loca-

tional design of parking facilities, has apparently not yet been accepted fully by all financial experts.

Financial Consultant Needed Also

We also needed a financial consultant. This consultant with his bond counsel would advise us not only as to the legality of the bonds but as to the entire set-up of the financial machinery including the necessary vehicle to be financially responsible, the methods of presenting the bonds to purchasers and, also of importance, the timing of the issue.

Since Providence had its bond counsel, we decided to request an opinion on the legality of the bonds to be issued under the Act, and to worry about financial acceptance later. The Supreme Court of the State of Rhode Island had recently handed down three advisory opinions on Acts which had certain similarities to our Off-Street Parking Act, and these opinions were getting progressively less in our favor. The advice received from the bond counsel reflected the complexion of the Court's opinions. The advice of a bond counsel is not legally binding but financial houses follow it meticulously.

The legal stumbling block in our Act was in large part the provision for leasing to private enterprise. There was a mandatory requirement that the facilities should be leased rather than operated by the city. This, together with the financial problems inherent in issuing *revenue* bonds under this law, prompted the preparation of a new Off-street Parking Bill stripped of its broad provisions for various combinations of conditions and aimed specifically at municipal development and operation under *general obligation* bonds.

We concluded that under our existing set of conditions it would be better to proceed with *general obligation* bonds. We believed we could expect no financial problems here nor indeed any legal problems. The Supreme Court had held, in its latest of three opinions, that a marina (marine parking lot) was a public purpose for which tax money and eminent domain proceedings could be used. Surely if the marine parking lot were a public purpose, even in Newport where boats may be more important than in any other place, terminal facilities for motor vehicles must be constitutional. It was held

however in the marina case that the facility could not be rented since a profit would incidentally be made on property acquired through eminent domain.

In April, 1950, a new bill was passed by the General Assembly and signed by the Governor. The new law provides for the development of parking facilities using public money and eminent domain, where necessary. The provision for betterment assessments has been deleted, authority for general obligation bonds has been added, and provision for operation either by the city or by private enterprise through leasing has been retained.

The Bill has the leasing provisions readily severable so that the Court can declare that portion unconstitutional and can find, as we hope, the remainder of the Act legal so that bonds can be approved for issue and facilities established. For the third consecutive year there has been off-street parking legislation before the General Assembly.

When creating essential off-street parking lots and garages, it is well to investigate legal and financial processes in order to clear the decks for good planning and engineering. In any jurisdiction where there is the least doubt of the thinking of the courts and whenever the use of *revenue* bonds is contemplated for a development as new as a municipal parking utility, experts who specialize in this kind of finance, and in this kind of law and engineering, should be assembled to work closely with municipal planning and traffic agencies so that the complexities of one phase will not foul up one or more of the others.

The best technical planning is of little avail if legal or financial impediments prevent final execution. A green light should be set up for facility development even if it means so radical a procedure as an amendment to the City Charter or State Constitution. The need for that action and the most efficient methods of attaining desired ends can best be obtained with the advice of experts in law and finance.

Policy, Program and Progress of San Francisco Parking Authority

VINING T. FISHER

Mr. Fisher has been General Manager of the Parking Authority of the City and County of San Francisco since December 1, 1949. Formerly he had been Manager of the Down Town Association of San Francisco, original sponsors of a Parking Authority, and Secretary to the Mayor's Citizens Committee on Off-Street Parking which officially recommended the agency. He was selected for his present post because of his executive and administrative experience and because of his familiarity with municipal problems.

THE Parking Authority of the City and County of San Francisco was created in accordance with state enabling legislation and pursuant to a declaration of necessity by the Board of Supervisors of the City and County of San Francisco, approved by Mayor Elmer E. Robinson on October 6, 1949.

The Authority consists of five members, all representative businessmen appointed by the Mayor with the approval of the Board of Supervisors, and a staff of five headed by a General Manager charged with the executive direction of the Authority's program.

The Authority has the responsibility for providing additional off-street parking facilities in the interest of the public health and safety and the convenience of the motoring public. It has determined that it shall seek its objective by stimulating private industry, if possible, and by direct action, if necessary.

The work of the Authority has been financed by appropriations from the General Fund of the city to defray the cost of administration as distinguished from capital investment. It is expected that initial capital investment will be made from a $5,000,000 off-street parking fund authorized by the electorate of the city in November, 1947. This will be available for buying land and constructing parking facilities, upon approval of the Board of Supervisors of the City and County. This fund will be provided by the issuance of general obligation bonds.

The History

The San Francisco Parking Authority, and indeed the enabling legislation that made it possible, the California State "Parking Law of 1949", resulted from concerted desire of the business interests of the City, the Administration, and the Board of Supervisors, to take constructive action to relieve the pressures of traffic congestion by providing additional off-street parking facilities.

Mayor Robinson in 1948 appointed a committee of representatives of the principal business and labor groups of the city. This was known as the Mayor's Citizens Committee on Off-Street Parking. Its purpose was to determine a practical plan of action to solve the parking problem. Following several months' research and deliberation, the committee concluded that, although various laws existed under which several departments of city government might act in the premises, nevertheless, "what was everybody's business, was nobody's business", and that a separate and autonomous agency of government with the responsibility and appropriate powers to initiate and prosecute an adequate parking program should be established. The committee recommended creation of a Parking Authority and enabling legislation to permit such action. That recommendation was approved by the Mayor and the Board of Supervisors and the necessary machinery set in motion to accomplish it.

The Parking Authority's Powers

The California State "Parking Law of 1949" granted the San Francisco Parking Authority numerous and extensive powers. Among these are the power:

1. To employ and discharge staff personnel subject to all limitations and rights applicable to similar employment by the city.
2. To acquire property by purchase, lease, gift, grant or otherwise.
3. To construct garages.
4. To lease garages for private operation, and if that should prove impracticable, to operate such parking facilities itself.
5. To exercise the power of eminent domain, with certain minor

exceptions, e.g., no existing off-street parking facility may be condemned unless the total contiguous land area to be acquired for parking purposes is at least three times the area of the existing facility.

6. To issue revenue bonds secured by revenues of its operating properties.

7. To accept allocations from the revenues of parking meters operated by the city.

8. To accept financial aid and assistance from various and numerous other sources.

The general policies and program of the Authority are best exemplified by its Declaration of Purposes, Policy and Program for Off-Street Parking Facilities adopted shortly after its organization.

The Declaration states:

"The Parking Authority of the City and County of San Francisco has been created by the 'Parking Law of 1949' of the State of California and for the purpose therein set forth. That purpose is the supplying of additional off-street parking facilities to reduce serious conditions of congestion of street traffic which is obstructing access to and use of both public and private property, increasing traffic hazards, impeding rapid and effective fighting of fires and the disposition of police forces and endangering the public peace, health and safety.

"The City and the State have declared that the supplying of additional off-street parking facilities and the performance of all undertakings incident thereto are public uses and purposes for which public money may be spent and private property acquired and are governmental functions.

"The Parking Authority has been created as an arm of City government with the responsibility of prosecuting the above program. It has been delegated the powers deemed necessary to accomplish this program.

"The program of the Authority contemplates the following steps:

"1. *Stimulation of private enterprise to finance and construct the facilities required under the off-street parking program.* In the event results are inadequate the Authority will proceed to the next step, namely

"2. *Cooperation with private enterprise in securing sites for garage construction.* Such garage sites, purchased by the Authority through negotiation or by process of condemnation, will be made available on mutually agreeable terms to private parties for construction and operation of garages thereon. Again, if results are inadequate, the next step will be taken, namely

"3. *Financing and construction of garages, including site acquision, by the Authority itself.* Private parties will then be invited to submit bids for operation of the completed project. In the event satisfactory bids are not forthcoming, the Authority will have recourse to

"4. *Operation of the completed facilities.*

"The Authority wishes to emphasize that it will exercise its powers of financing, site acquisition, construction and operation only as a necessary supplement to the ability of private enterprise to perform.

"The Authority has begun a study of existing garage capacities and parking demand together with all related factors and data necessary to establish areas of Primary Off-Street Parking Demand. The Authority will avail itself of all resources and facilities obtainable from all City departments, City offices and City officials in accomplishing its objectives. Following this study, it will propose a Master Plan for Off-Street Parking Facilities. Before final adoption, the Plan will be published in tentative form for the information and reaction of all interested parties and the public. Public hearings will be held, opinions invited and the Plan carefully reviewed before its final adoption as a blueprint of locations for public garage construction.

"Following adoption of the Master Plan for Off-Street Parking Facilities, the Authority will invite proposals or bids for construction of public parking garages in any or all of the locations of Primary Off-Street Parking Demand.

"Upon receipt of satisfactory proposals or bids, the Authority will select the most advantageous and proceed with the construction program.

"There is presently no basis on which a time schedule for completion of the foregoing program can be established. However, it will be the purpose of the Authority to:

"1. Assemble and analyze all data available on which to base a tentative Master Parking Plan.

"2. Hold public hearings and thereafter adopt a Master Parking Plan as the basis for official action.

"3. Receive and consider bids.

"4. Undertake to bring about a completion of approved proposals at the earliest possible date consistent with a proper consideration of all the foregoing factors and with the full realization of the necessity of continuing to give prompt attention to ways and means for the solution of our parking problems."

The Problem of Decentralization

The Authority faces the problem of nullifying the potential damaging effects of decentralization of the business section of the city. It has the responsibility of providing terminal facilities for a rapidly increasing number of automobiles.

In the last twenty years, the number of automobile registrations in San Francisco has increased from 160,000 to 255,000. According to a recent study, 228,000 motor vehicles enter downtown San Francisco between 7 a.m. to 7 p.m. of an average business day. It has been said with reason that "there are not enough legal parking spaces in the City of San Francisco in which to park them."

Permits for new public garage construction issued in San Francisco from 1930 to 1950 show that only ten were for new garages downtown, capacity 3,366 spaces. Of these, Union Square Garage and Bridge Terminal Garage, constructed as part of the San Francisco-Oakland Bay Bridge project, account for 2,327 stalls. Union Square Garage is a quasi-public enterprise accomplished according to a pattern which will be followed in the overall San Francisco Parking Program. The Bridge Terminal Garage pattern of public financing will receive consideration if necessary. Only 1,039 car spaces were provided by private industry in downtown San Francisco over

the last twenty years, an average of about 52 new car spaces per year. No permits for new garage construction downtown, except for one garage of 53 stalls, have been issued since 1941.

There has also been a material decrease in both off- and on-street parking accommodations in spite of the fact that some new parking lots have been opened during the period. The net result is that San Francisco has fewer parking accommodations for more and more automobiles. This condition has caused traffic congestion, has been damaging to business, threatens decentralization, and was the prime reason for the establishment of the San Francisco Parking Authority.

In analyzing the effect of traffic and parking congestion on business, the writer had occasion recently to investigate the relationship between San Francisco department store retail sales and the total retail sales of the San Francisco Bay Area. It was found that in 1935, the San Francisco department store retail sales represented 6.6 per cent of the total retail sales of the Bay Area. In 1947, the San Francisco department store retail sales represented only 4.7 per cent of the total retail sales of the area.

Thus, although business was booming, and gross sales in 1947 were vastly greater than gross sales in 1935, nevertheless, because the proportion was less, San Francisco business had suffered by comparison. Figures showed that if San Francisco department store sales in 1947 had maintained the proportion of the total they had in 1935, the stores' 1947 business would have been $46,000,000 greater than it was.

And the reason for this proportionate decline has been attributed in considerable degree to the increasing difficulty of driving and parking in downtown San Francisco. The task of the Parking Authority is to alleviate and, if possible, remedy such conditions as a guard against future business decentralization.

Needed: 6000 New Stalls Quickly; 14,000 by 1970

The Authority went into operation with the benefit of a backlog of factual data on traffic and parking conditions in San Francisco. This was available as a result of numerous studies over an extended period. The most recent of these had reviewed the parking situation in con-

siderable detail and had forecast the amount of new off-street parking accommodations required to meet existing and future parking demand. According to that estimate, it is incumbent upon the Authority to provide about 6,000 additional off-street parking stalls as quickly as possible to supply the immediate demand, with a total of 14,000 additional stalls required by 1970. Depending upon land and construction costs, the total program as now visualized has been predicted to involve an investment of from $30,000,000 to $50,000,000. It is anticipated that all this may be accomplished without cost to the taxpayers in spite of the magnitude of the program.

San Francisco successfully pioneered in the field of underground garage structures with the building of its world-famous Union Square Garage some ten years ago. Inspired by that example, the Parking Authority contemplates using the sub-surface areas of other public parks and squares early in its program. It believes that certain major advantages follow this approach.

Although it is recognized that underground construction is somewhat more costly than surface construction, it is felt that factor will be outweighed by other considerations. In the first place, the land is already available in several strategic locations and may be utilized without cost to the city, without delay, and without removing property from the tax rolls.

Underground Parking Projects Are Studied

With this in mind, the Authority has begun studies toward the construction of the first units of its over-all program beneath two downtown public parks; St. Mary's and Portsmouth Plaza, and one public square; the Civic Center Plaza fronting on the San Francisco City Hall, the State of California Building, the San Francisco Public Library and the San Francisco Civic Auditorium. Definite exploration of the possibilities of St. Mary's Park and Civic Center Plaza has already begun. The greatest progress has been made on the St. Mary's Park project.

St. Mary's Park lies within a block and one-half of the city's crowded financial and insurance district on and closely adjoining Montgomery Street. It offers the possibility of an underground

garage of some 600-car capacity. Test borings have demonstrated that construction is practicable. Several responsible, potential builders and operators have indicated a desire to bid for the use of this property.

Architects' View of Underground Garage Entrance and Exit.

A preliminary estimate puts the cost of construction at $1,500,000. If further studies lead to a positive recommendation of a garage in this location, it is proposed that private industry be invited to finance and construct the garage upon condition of an extended lease of the facility by the city for a period sufficient to amortize the investment and return a reasonable profit.

Thus the city would, in the long run, acquire a permanent parking facility of substantial value at no cost. As of the date of this writing, it appears that several responsible firms are prepared to make offers on the basis described above. It is expected that the same pattern will be followed at Civic Center and Portsmouth Plaza.

Civic Center Plaza is sufficiently extensive in area to permit construction of an underground garage of 2,000–3,000 car capacity. Preliminary estimates place the construction cost at approximately

$3,500,000. Estimates of capacity and cost on Portsmouth Plaza have not yet been made.

A study of the possibility of a surface garage intended, like the St. Mary's Park project, to serve the financial district is also in process by the Authority. Known as the Kearny-Pine-California project, this garage would be a seven-level surface structure located within one-half block of the corner of California and Montgomery Streets, the hub of the Wall Street of the West. This garage would be of 1,000–1,100 car capacity.

The estimated cost is: Land—$750,000; construction—$1,000,000. The proposed method of financing this garage, if built, is that the city provide the site and private industry the structure, each at its own expense, with the proviso that the builders and operators reimburse the city for the cost of the land in annual installments over the period of the lease.

The law requires that where city-owned property is used as sites for the construction of garages, either publicly or privately financed, title to the land and the improvements shall vest in the city and county. Consequently it is understood, in the case of the off-street parking projects under present consideration, that ownership shall vest in the city and the city will lease the facility on terms and for a period that will assure an operating profit for builder and operator and also enable both private investors and the city to recapture their original investment in the property.

At the expiration of the original lease, full operating control will vest in the city. In the event it becomes necessary for the city to finance the total cost of the proposed garages, they will be leased for private operation on terms that will assure full return of its investment to the city. Furthermore, larger rentals for the city at the end of the original lease will be an additional substantial permanent asset.

The Authority has already started to lay a foundation for the city-wide plan of off-street parking facilities which its full program must embrace. With preliminary negotiations under way on the first units of the program, examination of potential locations for garage units to serve the whole downtown business and retail shopping area has begun.

Neighborhood shopping districts are also clamoring for parking

relief. In limited degree, these business areas have the same problem as downtown and will receive attention as rapidly as circumstances permit.

"Little if Any Cost to Taxpayers"

The San Francisco Parking Authority is proceeding on the assumption that construction of the garage system envisioned in the over-all program of off-street parking for San Francisco can be financed with little, if any, cost to the taxpayers.

The Authority has been encouraged by the expressed willingness and evident desire of private business and private capital to cooperate to the fullest possible extent in realizing its objectives. Its announced policy is to utilize such assistance to the fullest. Its early experience indicates that joint action will permit vital economies in two essential phases, operation and financing.

The roadblocks to adequate garage facilities for the general public have been high construction costs, high labor costs and high financing costs. Taken together, they have retarded or stopped new garage construction by private industry. The high cost of financing appears to be the one most susceptible to correction through public action. Preliminary forecasts in San Francisco appear to indicate that if that factor can be improved, private industry can be put in a position to build the new parking facilities required to improve the city's parking situation. The Authority is therefore giving primary consideration to that aspect of the problem.

A Plan of Attack

The San Francisco Parking Authority plans to attack the present high cost of garage financing in the following ways:

It will seek to make the sub-surface areas of public parks available for garage sites on a reasonable rental basis, thereby effecting a substantial reduction in the cash investment necessary for the projected parking facility. Thus, although prevailing interest rates of from 4 per cent to 5 per cent must be paid by industry for the funds to finance construction, the net effect will be to secure a much lower credit cost than the garage industry would face without such as-

sistance. Furthermore, there would be a considerable tax concession by reason of the fact that only the leasehold interest will be subject to ad valorem tax.

It will seek to make sites available for surface garages on the same basis as those for underground garages, with a rental requirement sufficient to amortize the cost of the land. This will accomplish a similar reduction in financing costs. It should be noted that in cases such as this, where property is removed from the tax roll, the taxes to be derived from leasehold interests will exceed those previously collected from old buildings on the existing site.

It will, if necessary, provide the full cost of both land and construction by seeking an appropriation for the purpose from the city's $5,000,000 off-street parking fund or the issue of revenue bonds secured by the facility.

The basic element of any of the procedures for reducing the cost of garage financing contemplated by the Authority is, of course, the application of public credit to the problem.

Although a separate legal entity, the Parking Authority of the City and County of San Francisco enjoys the benefit of the assistance, advice and counsel of Mayor Elmer E. Robinson, the Board of Supervisors, City Attorney, Chief Administrator, Controller, City Planning, City Engineer, Public Works, and other Civic offices. With such cooperation, it is confident of the success of its assignment; more automobile parking for the people of San Francisco.

Mechanical Maintenance of a Car

J. WILLARD LORD

Mr. Lord, a graduate mechanical engineer, has been engaged in motor vehicle maintenance and accident prevention for the Atlantic Refining Company since 1934. Previously he was regional service manager for General Motors Export Company in South America. For the fifteen years prior to that he was in the service department of the Pierce Arrow Motor Car company, the last six as General Service Manager in the New York City metropolitan area.

THE average owner wants to maintain his car so it is safe to operate. If Dr. Gallup were to survey the public on this matter, all would probably insist that they do not let their cars get into dangerous condition. Yet even though mechanical failures are comparatively few, many cars have maladjusted brakes, steering assembly, lights, or other parts that increase the hazards of driving and may contribute to accident.

Most people are not proud of an accident, and even your good neighbor may not divulge that he had an accident until two or three years after it happened. Also, many people point to the "other fellow" as fully responsible though he contributed only in part to an accident. If no other fellow is involved, they charge mechanical failure as the cause of an accident and refuse to recognize or admit their own failure either in their manner of driving or in the maintenance of their car.

Mechanical Condition Versus Attitude

Poor mechanical condition not only affects the vehicle's performance, it also reacts on the driver's attitude. A dry, harsh, squeaky clutch pedal makes it difficult to engage the clutch smoothly; it may cause the driver to stall the engine and can be most irritating. If steering apparatus lacks lubrication, steering may be difficult and fatiguing. A mechanical tap or noise may divert the driver's attention.

A stalling motor can be irritating and highly dangerous. It may leave the driver in the middle of an intersection angry and confused, a target for cross traffic, with a din of horn-sounding. Because he is emotionally upset, he may suddenly lunge ahead, clearing one vehicle only to strike another.

A few cost-figures on maintenance show how an operator can keep his car in safe operating condition at low expense.

Cost of Maintenance

Maintenance includes first and foremost, lubrication to prevent the machine from tearing itself to pieces; second, mechanical adjustments of brakes, steering, ignition, and lights, and such items as washing and polishing; third, repairs aside from those caused by accidents: relining brakes, renewing the battery, replacing spark plugs, hose connections, and engine repairs.

The figures presented are typical, subject to variations depending on yearly mileage and locality of operation. For instance, in the south and southwest temperatures are higher, average speeds are higher, gas mileage lower and tire life shorter. Driving in traffic is hard on clutch and brakes and gasoline mileage will be low. However, the figures show thorough lubrication is a minor item of total running expense. It amounts to only about 12½ per cent of the whole.

REPRESENTATIVE CAR COSTS—CHEVROLET-PLYMOUTH-FORD CLASS

	VARIABLE COSTS/MILE			FIXED COSTS	
	Cents	*Per cent T.R.Exp.**			*Dollars*
Gasoline	1.64	54.4%		License	11.00
Oil-Changes & Additions	.25	8.4	= 12.5%	Insurance	134.00
				Inspection	2.00
Chassis Lub.	.12	4.1		Wash & Polish	21.50
Trans. & Diff.	.04	1.3		Anti-freeze	2.00
Tires	.31	10.4			
Repairs	.58	19.3		Total	170.50/year
Collision	.06	2.1			14.21/mo.
*Total Running Exp.	3.00	100			
Depreciation	1.61				
Total	4.61				

Car Lubrication

Car lubrication comprises periodic chassis lubrication and changes of motor oil, and there is greater acceptance than ever that this lubrication should be performed at thousand mile intervals. Occasionally there has been comment that owners were being urged to change oil more often then necessary. With it has gone the unfortunate implication that one way to effect economy in car operation is to cut down on car lubrication. Nothing could be further from the truth. The implication is almost sabotage.

A well organized fleet of trucks or buses adheres to a rigorous schedule of lubrication as the cheapest and most effective preventive maintenance. Blessed with a thousand mechanical devices, it seems to me we permit their rapid deterioration for lack of a bit of lubricant. When to change motor oil has long been a topic of conversation, but chassis lubrication, in spite of the recommendations of car manufacturers and oil companies, has not enjoyed the same interest. Yet it is quite as important, bears directly on the extent of repairs, economical and safe operation, and costs only about 4 per cent of the running expense.

Wide experience over the years has shown that if the chassis is lubricated every thousand miles, king pins, the steering arrangement and front suspension will remain snug; shackles will give long wear; pedals will not develop side shake, and in general the chassis will give good service and remain quiet. Of course car operation in rain and mud or a large amount of gritty dust requires shorter periods between lubrications to counteract these severe conditions. Once the working surfaces of the chassis become dry and are operated dry, it's easy for dirt and mud and water to roughen surfaces and the rate of wear is greatly accelerated. Even when lubrication finally is applied, the damage has been done and wear will go on at an accelerated rate.

A car with only 25,000 or 30,000 miles of use but poorly maintained is unsteady, steers badly, and is sub-standard from both an operating and safety viewpoint. The owner can say he has saved about $15 in two years' operation, but he has given up something more valuable, two years of smooth, easy-handling operation and his

own safety. If he wants to drive the car further, the chances are he will have to spend from $75 to $100 to overhaul the entire front end, the rear suspension, shock absorbers, and probably the universal joints.

Scheduling Lubrication

An easy way to schedule regular chassis lubrication is by even 1,000-mile speedometer readings rather than by a sticker to remind you to lubricate at some odd mileage. Of course complete lubrication includes the generator and starter, door locks, hood hinges and small ball-socket and other mechanical connections. If you use the speedometer as a reminder, the job of lubricating front wheel bearings and steering gear housing at 5,000 or 10,000 mile periods, and repacking universal joints at 15,000 mile periods depending on manufacturers' recommendations, stands a good chance of receiving attention when the speedometer registers these mileages or multiples of them.

Changing and Adding Engine Oil

What about changing the engine oil? Car manufacturers and oil companies have recommended changing the oil at 1,000, 1,500, or 2,000 miles; and some advise changing the oil and lubricating the car once a month. Many factors influence these various recommendations, depending upon where the car is operated, whether in slow city traffic or running long distances on open highways, and whether the car is old or new.

Along with low speed and high speed operating conditions has been the constant improvement in engine design, raising of compression ratios with higher engine temperatures and a parallel development in engine oils to meet the more severe operating conditions.

Before detergent oils appeared, it was common experience on taking down an engine to find the valve chamber and the entire inside of the engine covered with soft, oily carbon. This same material plugs the oil control rings causing excessive oil consumption. Detergent oils hold such matter in suspension and when the drain plug is removed, it goes out with the old oil instead of remaining in the engine to make trouble.

The owner who drives only short distances and at moderate speed should not get the impression that such operation is advantageous to the engine and the oil. On the contrary, such operation produces a high rate of oil contamination with little or no heat to cook off the contaminants. There is much evidence to show that short-run "cold operation" of a few hundred miles a month is far tougher on the engine and the oil than when the car is driven 2,000 or 3,000 miles a month and the engine operates for hours at good heat. How many of you have taken a long vacation trip and have been delighted with the way the "old bus" responded and started running better than ever? The engine responded to good operating temperatures. Thus a change of oil at 1,000-mile intervals is as necessary for the 20 mph car as for the car that is driven harder.

There are exceptions to this general statement. Taxicabs, milk wagons and some doctors cover 1,000 to 2,000 miles a month, but with largely "start and stop" cold operation, inviting sludge formation and the plugging of oil rings. Cold operation is and has been the "headache" of the industry. It is something that the 1,000-mile oil change will not entirely control, and it is what brings engines into the shop at low mileage (20,000) for new rings and related work.

An automobile is a mechanical device of many moving parts requiring lubrication. Experience shows that if lubrication is thoroughly maintained, today's automobile chassis will give 50,000 to 75,000 miles or more of satisfactory service before major repair work is necessary, and the engine would do likewise except for start and stop cold operation. People try to save $5 or $10 a year by letting lubrication go, and find themselves with an automobile which at 25,000 or 30,000 miles shows all the wear one would expect to find at 60,000 or 75,000 miles of service. And they are not having the pleasure of driving a machine up to par. A sub-standard machine that may be hard riding, full of squeaks and rattles, and does not steer any too well detracts from enjoyable and safe operation.

Sometimes people brag that their engine does not use oil. On the other hand some are apprehensive if the engine doesn't consume some oil. They want to see at least a little oil used because it indicates that oil is getting to the top of the cylinders and that top rings are

being lubricated. The consumption of some oil is normal. When an engine requires a quart or two of oil for 1,000 miles, it is more of a healthy sign than otherwise, and the cost is only 30 or 60 cents. When it requires a quart every 150 to 200 miles then one should balance the cost of $1.50 to $1.80 for 1,000 miles, or $18.00 to $20.00 a year, against the cost of a ring job which may run from $75 to $100. The question then is whether to keep or dispose of the car. The cost of thorough lubrication is only about 12½ per cent of the running expense and is the cheapest and best insurance for getting the most out of a car with a minimum of repairs.

Tires

It is not always easy to get the real truth about tires. For instance, a driver says the right rear tire blew out, but fortunately he was moving slowly. He had never rotated his tires. Occasionally he looked at the front tires as exposed under the front fenders but he had never really taken a good look at the rear tires.

The right rear tire, under normal operating conditions, will wear about twice as fast as the left front, yet often this does not register until one learns the hard way. This driver ran the right rear tire until he wore a hole in it and it blew out. Let's not blame the tire for this accident. This was a driver-failure to inspect and take care of his tires.

Sometimes in an accident where a car leaves the road it is claimed that a tire "blew out." The tire casing is found in good condition, not worn or cut, but if one will examine the point where the tire blew out, it becomes evident that the casing was pushed in and ruptured by striking a sharp stone or stump or some protruding object *after* it had left the highway. The blown-out tire was in reality one of the casualties of the accident and not the cause of it. Unless thorough investigation is made, such an accident is likely to get into the records as being due to a tire failure.

Mile for mile, tires wear faster in summer than in winter. They are sensitive to heat, speed and load. Correct air pressure is the consideration for controlling tire expense. Tires should be held to within

10 per cent of their recommended pressures, and pressures should be checked when tires are cold. Ten per cent of 28 pounds is only 2.8 pounds, but it is easy to maintain pressure to close limits.

It pays to switch tires diagonally from time to time—7,000 to 10,000 miles for 28 or 32 pound tires, but more often for the latest low pressure tires. It depends on how they are used and how they are wearing. It makes for longer life, smoother operation, uniform wear and consequently uniform tire traction. We should try to balance tire traction by uniform condition of treads. One new tire and three smooth ones are not a good combination from a safety viewpoint.

Finally, wheel and tire balance also affect economy and safe operation when a car is driven in higher speed areas. Where wheels and tires are out of balance there is likely to be a continual vibration distinctly felt in the steering wheel which doesn't do the steering arrangement any good and is hard on the tires.

Brakes

A driver will complain that the left front wheel locked and skidded him off the road. Thorough investigation of the entire brake system will disclose it to be in good operating condition. The chances are that the driver found himself in a tight spot, applied brakes up to the point of locking the wheels. Mud or loose gravel on one side of the highway may have set up unequal traction, contributing to a situation that took the vehicle off the road.

A wheel will lock if you strike a slippery spot and put the brakes on with sufficient force. But should a "locked wheel" be blamed, or was there a driver-failure in not noticing the mud or loose gravel until too late?

Another accident where the driver says the brakes failed to hold: Examination of the brakes discloses the linings on all four wheels practically worn away and the drums cut. One wheel has a little more lining than the others and the car makes a wonderful tire squeal, but you can hardly stop it. Certainly this accident should not be charged to "defective brakes," but to an owner who could not stop long enough to get his brakes relined when the car first began warning him that the brakes were not effective.

Again, a driver involved in a rear end collision says, "The brake pedal suddenly went to the toe board and there were no brakes." Examination shows ample oil in the system, the master cylinder OK, the wheel cylinders OK and the linings only half-worn. But the vehicle had been operated without a brake adjustment until the pedal had to be pressed practically to the toe board to engage the shoes with the drums. This driver was getting around by pumping up his brakes on every application until he finally got into a tight pinch where there was not time to pump up the brakes. This was not a case of defective brakes, but a driver-failure to keep brakes in adjustment and unwillingness to admit that he had been pumping the brakes in order to stop.

Then take these two accident reports of intersection collisions. In each case, the driver of the offending vehicle steps out of his car with a set of brake linings in his hand and says he was just on the way to the repair shop to get his brakes fixed. These cases are not of mechanical failures. These are human failures. Failures to maintain brakes in safe operating condition. Let's "pin the lily" where it belongs, right on the driver and not on a mechanical defect in the car.

Stories of this kind rarely get into newspapers or periodicals where they reach a wide section of the public and help to develop a sense of individual responsibility. Newspapers are inclined to say the brakes failed or that "the car hit the tree" or that a foggy night was responsible for ten accidents; when in truth, the driver wore out his brakes or drove his car in such manner that it hit a tree; and ten drivers drove in such manner through fog that they were involved in accidents. These are driver failures, not vehicle failures.

Brake Repairs

Economical care of brakes calls for replacing linings before rivets or shoes start cutting the drums. If drums are cut they will have to be turned and refinished; or if deeply cut they will have to be replaced. This is expensive and one of the penalties for letting brakes go too long without attention. Care of the brakes calls for a trustworthy shop. Brake lining manufacturers are in a highly competitive field and it is common to find them making at least two grades of linings.

(1) A price-competing lining sold by "price" supply houses. A product to meet the demands of the used car repair market and cheap repair shops.

(2) A quality lining where the manufacturer incorporates the best of design and of materials to turn out the best lining possible, and where the coefficient of friction of each piece is determined for best results.

There is not a lot of difference in cost between the cheapest and the best. It may make a difference of $3 or $4 in the total price of a brake reline job. But the labor to put on linings is practically identical whether they are the best or the cheapest. With cheap lining, the chances are that brakes need adjustment every 1,000 or 1,500 miles instead of every 7,000 to 10,000 miles. The money saved in the cheap job is expended in frequent adjustments. Inside of 9,000 or 10,000 miles the car will probably be back in the shop for another brake relining job. On the other hand, the quality job will last possibly three times as long. The "cheapest" brake job is the most expensive per mile, and you will have sub-standard brakes every mile driven.

Grease leaks have a definite effect on safe brake operation. A grease leak may cause a wheel to grab. While this may not be serious on dry pavement, it becomes serious as speeds increase. It becomes *very* serious on wet pavements. The thorough brake job includes a check of grease retainers and a check of the hydraulic system operating the brakes. In other words, when brake work is necessary, buy the best from a trustworthy shop. It is the lowest price per mile.

Care of the Engine

Aside from lubrication, the engine should require little attention other than an occasional check and cleaning of the cooling system, tightening cylinder head, manifold studs, and periodic tune-up until the car has gone from 40,000 to 50,000 miles, when a change of rings may be necessary. Once in a while, a valve may make trouble.

Great advances have been made in carburetion. Probably one of the biggest steps was fixed jets, leaving only the idling adjustment to be made and readjusted as necessary. This adjustment does need

attention from time to time and more often than not the idling mixture will be too rich and can be cleaned out advantageously. Leaving the choke out not only uses a lot of gasoline, but excess of raw fuel dilutes engine lubrication and can be most harmful.

A second possible choke on the carburetor is a dirty air cleaner. The air cleaner stands between the engine and a lot of gritty, abrasive dust that in the days before cleaners was a major cause of engine wear. As it gets dirty it restricts air flow and begins to act as a partial choke. Manufacturers recommend cleaning the air filter at periods of from 1,000 miles or every 30 days, to 2,000 miles up to a maximum of 5,000 miles. It depends on where and how the car is operated. Traveling over generally good roads and highways the filter might well be cleaned at intervals of 2,000 miles.

Manufacturers are slowly increasing compression ratios and oil companies are raising octane ratings to meet the requirements of new engines. Higher compression presents new ignition problems. It calls for special ignition equipment capable of operating under new and severe conditions. To keep this equipment at peak performance requires rather frequent checking, possibly at 5,000-mile intervals. But for the older cars fitted with standard ignition equipment checking and tune-up at 7,000 to 10,00 miles, or even longer intervals should suffice.

The engine tune-up involves the amount of work necessary to secure an effective job. Spark plug gaps burn open and lead to misfiring, usually the first indication of tune-up need. Also, on cold days wide gaps will cause hard starting. The tune-up job today is likely to include a new set of points, a new condenser and labor to install them. Some of the older points and older condensers had a rather limited life, but today breaker points are good for 50,000 to 70,000 miles of service and condensers will give 80,000 to 100,000 miles. It pays to use genuine factory replacement parts.

The Clutch

The car clutch is built to do a tremendous amount of hard work and to take a tremendous amount of abuse. Clutch wear can be reduced to a minimum by engaging the clutch with care and actually acceler-

ating the vehicle with the engine rather than by slipping the clutch against a racing engine with a wide open throttle. Clutch-slipping is a common driving fault, sometimes indulged in to avoid gear shifting, but it costs money.

Clutch-pedal travel changes because clutch plate linings wear and the pedal comes back further and further until it starts striking the floor board. If no adjustment is made in the linkage, the floor board holds the clutch from engaging fully and in a short time the clutch will burn out. Aside from the expense of this replacement, a slipping clutch is a hazard likely to leave one stranded on a hill or in other dangerous situations contributing to accident. The clutch pedal must have ½" to 3/4" free travel or clearance before it starts to disengage the clutch. The adjustment can be made in a few minutes at a nominal charge and it should last for thousands of miles.

Steering

Nice steering is all-important to safe driving. Adjustment of the steering worm and sector is occasionally necessary along with periodic lubrication. But also, the whole steering assembly, if it is to give long service without repair, needs to be lubricated consistently at the mileage periods recommended by the manufacturer, usually every 1,000 miles. Letting it go to 1,500 miles may do more damage in that last 500 miles than in the previous 10,000 lubricated at 1,000 mile intervals. Once the damage is started from lack of lubrication, there is a permanent loss that is never recovered. Service station personnel see cars at 18,000 or 20,000 miles with whole steering arrangement worn and in need of complete overhaul. On the other hand, a truck whose driver each morning gave the king pins and connections just a bit of grease had at the 130,000-mile mark a steering arrangement that was almost as good as new.

Shock Absorbers

Shock absorbers play an essential part in safe steering and in the road performance of today's automobile. It is not expensive to keep them in good repair. Everyone has followed a car traveling over a

poor piece of road where shallow holes cause the vehicle to lunge and bounce up and down causing the driver to lose much of his steering control. Rough "wash board" spots on a road, possibly on a turn, cause the rear wheels to dance a jig. The car seems to lose all side traction and goes for the ditch. If the shock absorbers are in good condition, this uncomfortable rough riding and side bouncing do not develop. Shock absorbers are an essential part of car suspension and should be kept filled with oil.

The Battery and the Generator

Probably everyone has either experienced or come upon a car stalled in a busy street or intersection with a dead battery. It is annoying and can be dangerous. During the life of a car, the battery is likely to be replaced several times. Here again a highly competitive market results in manufacturers making two or three grades of batteries. The better batteries will last longer, carry a longer guarantee and give less trouble. They will contribute to easier starting in winter because they are able to deliver the maximum starting current and hold voltage high enough to give best ignition.

Aside from water, the generator is the very life of the battery. If it under-charges and starves the battery, battery life will be greatly shortened. The generator as a rule makes little trouble, but occasionally something happens to a brush or the commutator and the charging rate falls to zero. Unless this is promptly remedied the battery will be dead, perhaps when the car is most needed. One should look occasionally at the ammeter on the dash and note that the generator is charging. Where a voltage regulator is used the charging rate may be nearly zero but by switching on head lights one can tell whether or not the generator is taking care of the demand for current.

Headlamp Maintenance

We hear and read a great deal about night blindness. Many people do not like to drive at night because of highway glare and the difficulty they have in seeing. Undoubtedly there are people who do not see well at night and whose glare recovery is slow. But test equipment

has clearly demonstrated that one's ability to see in the face of fixed glare is not a constant, but depends on how much light is thrown on the objects one is endeavoring to see. In other words, headlamps aimed with accuracy so that the light is thrown straight ahead and onto the road would enable many drivers to see more clearly at night in the face of glare. Getting one's headlamps accurately aimed and keeping them in this condition not only reduces glare for the other fellow, but it puts all the light of the headlamps on the road ahead of the driver to his advantage.

Sealed beam lights have made a tremendous contribution to safe night driving but even these occasionally burn out a low or high beam filament. A car may have both high beams lighted at once, but upon switching to low beam there is only one light. The hazard is obvious.

A clean windshield inside and out does wonders in aiding drivers to see at night and to drive without tension and nervous exhaustion. Finally, drivers should recognize that lights serve two purposes; first to help one see what is ahead on a dark road, and second, at dusk, in daylight fogs, rain and snow storms, to help the other fellow see you.

Conclusion

Responsibility to maintain a car in safe operating condition rests with the driver. Most so-called brake failures, tire failures, engine failures, and so on, are not equipment failures; they are failures of the driver to maintain his car in safe operating condition.

A safe car is one that is properly maintained. Yet, the fact is that thousands of motorists—careful people in many other respects—are foregoing much of the comfort, ease of control, and driving pleasure the manufacturer has built into the car, and endangering their lives because they fail in their responsibility to maintain their car in really safe condition. They are inclined to look for bargains when they make repairs or replacements and to ignore quality.

Thorough investigation of accidents proves neglect doesn't pay, and that neglect and not mechanical failure is at the bottom of many accidents.

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